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BUILDING CODE

RECOMMENDED BY

THE NATIONAL BOARD
OF
FIRE UNDERWRITERS

An Ordinance providing for fire limits,
and regulations governing the construction, alteration, equipment,
repair, or removal of buildings or structures

FIFTH EDITION

Revised Reprint 1934

NATIONAL BOARD OF FIRE UNDERWRITERS
85 JOHN STREET, NEW YORK

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Foreword

IN the general movement for the reduction of fire losses in this country, the National Board of Fire Underwriters has for many years advocated the adoption by municipalities of building laws representative of good and safe practice in building construction. The first edition of the National Board Building Code appeared in 1905, since which time three revisions have been made, in order to keep abreast of changing conditions in the building industry and to present the best thought in connection with construction and the reduction of the fire hazard. In recent years, new developments in building construction have made desirable a general revision of the Code, and the data herewith presented comprises the latest thought in building code recommendations. It contemplates the prevention of fire, and not merely protection against it.

Practically every good-sized municipality in every state in the Union used the early editions of the National Board Building Code in the framing or revision of their building regulations; and many municipalities adopted it practically in its entirety, or used considerable portions of it.

The service which the National Board renders to municipalities in connection with their building regulations is not, however, limited to the distribution of the Code, but includes consultation with local committees charged with the revision of building regulations, a review of their proposed codes, and comment upon their suggestions which, if accepted, will bring their codes into harmony with the Building Code of the National Board.

The National Board Building Code is used as a text-book in numerous colleges and other educational institutions. Within the last three years (1928-30) hundreds of copies have been supplied to more than fifty schools of architecture and engineering throughout the United States and Canada, including the School of Architecture of Harvard University; Sheffield Scientific School of Yale University; Department of Civil Engineering of New York University; School of Architecture of Columbia University; McGill University, Montreal, Canada; School of Architecture, Princeton University; Georgia School

of Technology; Armour Institute of Technology, Chicago; Department of Civil Engineering, Iowa State College of Agriculture and Mechanic Arts; Department of Architecture, University of Texas; Department of Civil Engineering, University of Colorado; Department of Civil Engineering, University of California; Alaska Agricultural College and School, Fairbanks, Alaska.

In the preparation of this Code the principle has been followed that under the police power the requirements and restrictions relating to building construction should be stated in as broad terms as consistent with the attainment of public safety, public health and general welfare. It has, however, been necessary in certain matters included in the code to be specific and detailed. Thus, for instance, the exit facilities for various occupancies under different conditions must be definitely described. The proper minimum requirements for healthful conditions of light and ventilation are not sufficiently well established to allow too great a freedom to the designer. Certain fire-prevention requirements, such as the mounting and clearances of heat appliances, are too important to be indefinite.

In the arrangement of this Code, the general division into articles follows closely the recommended chapter headings of the Building Code Committee, U. S. Department of Commerce, of which the late Ira H. Woolson, consulting engineer to the National Board of Fire Underwriters and compiler of previous editions of this Code, was chairman. This latter arrangement was formulated under his supervision, after much discussion, and many comments and criticisms from building officials, architects, builders, and other experts, in the hope that it might serve to bring about greater uniformity in arrangement in building codes.

It is quite possible that in adapting the Code to the needs of a municipality, some changes, omissions and additions may be required. Some of these are indicated in the annotations in the text. It is urgently recommended, however, that no change in the substance of the Code and only such in the language as is essential to adapt it to local needs, be made. A change in one part may, unless well considered in relation to other parts, seriously weaken or invalidate some important provision. The annotations in smaller print are, of course, not a part of the text to be adopted.

This recommended Code presumes to regulate all matters relating to the construction, alteration, removal or demolition of buildings or structures; and so much of the equipment, occupancy

and maintenance as must be considered in the planning; and so much of the equipment as must be installed as the building operation progresses. At the same time that this building Code is adopted it is strongly urged that the "Suggested Fire Prevention Ordinance" promulgated by this Board be also enacted into law to provide for adequate regulation of those features of equipment, occupancy and maintenance which are not provided for in the Building Code. It is essential that municipalities have an adequate and competent building inspection.

The present revision has been prepared under the direction of the Committee on Construction of Buildings of the National Board of Fire Underwriters, assisted by Rudolph P. Miller, consulting engineer, former superintendent of buildings of the Borough of Manhattan, New York City, and one time chairman of the Board of Standards and Appeals of that City. In this work the Committee was aided by Geo. W. Booth, Chief Engineer, and A. C. Hutson, Assistant Chief Engineer, of the Committee on Fire Prevention and Engineering Standards, and by Clinton T. Bissell, Associate Consulting Engineer of the Committee on Construction of Buildings, and other members of the engineering staff of the National Board of Fire Underwriters. The assistance rendered by A. K. Small, Vice-President of Underwriters' Laboratories, was also especially helpful.

Special acknowledgment is hereby made to Robert D. Kohn, New York City, President of the American Institute of Architects and President of the New York Building Congress; to William K. Hatt, Lafayette, Indiana, Chairman of the Building Code Committee, U. S. Department of Commerce, and Professor of Civil Engineering at Purdue University; and to Charles Derleth, Jr., Berkeley, California, Professor of Civil Engineering and Dean of the College of Engineering at the University of California, for their courtesy in reviewing this Code.

Mr. Kohn states:

"I have nothing but admiration for the thoroughness with which this Code has been prepared."

Dr. Derleth comments:

"It is with pleasure that I endorse the Building Code, fifth edition, 1931, as recommended by the National Board of Fire Underwriters.

"I am fully acquainted with all earlier editions of your standard work. In fact I have found them instructive for students and have used them as a text for twenty years in advanced

classes in structural engineering at the University of California.

"It is not enough to prepare a building code or city ordinance to ensure strength and stability in buildings. Of equal importance are the requirements of fire resistance, fire prevention, exposure, public health, ventilation, and such broad questions of public and private welfare as equipment, occupancy, rentability, etc.

"A building code is not a design specification. Nor is it a set of plans. The methods to be followed under proper police or supervisory powers are important; but still more important are the purposes to be attained.

"Communities must be protected by well informed inspection bureaus. These bureaus must have authority and sufficient man power to examine plans, issue permits and inspect construction.

"It is in the broad aspects of the building code that your National Board of Fire Underwriters has done its great and classic service.

"Each edition of the Code has been an improvement on the one preceding. Your latest edition has removed obsolete material and inserted new subjects, such as welding, which have become of great prominence in recent years. I note with satisfaction your reference in the appendix to requirements for earthquake and tornado design. In certain localities these references will be of timely importance. They indicate the trend in a new field of improvements brought to our attention by the lessons recently learned in Japan, California and Florida.

"I approve the rearrangement of the text into articles following the recommended chapter headings of the Building Code Committee of the U. S. Department of Commerce. In this way each broad subject has its chapter, and each special topic finds its place with related data.

"I am confident that much good will result where a municipality takes advantage of your Code, making only such changes as local necessity may dictate; interpreting the instrument always by a competent and sufficiently manned bureau of inspection.

"What is needed in America is a reduction of fire losses, less fire and tornado hazard, more public safety, public health and general welfare. In these directions your association has done its great work."

Professor Hatt writes:

"I have given a very careful reading to the Building Code

recommended by the National Board of Fire Underwriters. This is a very clearly written and well arranged document and reflects great credit on the writer who has accomplished a very complicated work in which the several parts are so well tied together without confusion. It follows very closely the recommendations of the Building Code Committee of the Department of Commerce in those matters upon which the Building Code Committee has drafted recommendations. The Building Code of the National Board of Fire Underwriters appears to me to be drafted in the public interest and can be recommended for adoption by all municipalities."

Comments and criticisms from all parts of the country by members of the Advisory Engineering Council to the Committee on Fire Prevention and Engineering Standards have also been exceedingly helpful. Useful suggestions and information have been contributed by the technical staffs of the American Gas Association, American Institute of Steel Construction, Associated Metal Lath Manufacturers, Common Brick Manufacturers Association, Gypsum Institute, National Lumber Manufacturers Association, Portland Cement Association, Steel Joist Institute, and Structural Clay Tile Association.

NATIONAL BOARD OF FIRE UNDERWRITERS,
85 JOHN STREET,
NEW YORK.

Copies of the code may be had on application at the offices of the National Board of Fire Underwriters at 85 John Street, New York; 222 West Adams Street, Chicago and 1014 Merchants Exchange Building, San Francisco.

The portions of the Fifth Edition, 1931, which are revised in the Revised Reprint, 1934, are Sections 1002-6(a), Partitions (Fireproof Construction), 1003-4, Partitions (Semifireproof Construction), 1105, Gas Appliances, 1202-4, Smoke Pipes—Clearances and 1212, Oil Burning Equipments. With these exceptions the 1931 and 1934 issues are the same. The Revised Reprint, 1932, included the revisions of Sections 1105, 1202-4 and 1212.

TABLE OF CONTENTS

| ARTICLE | PAGE |
|---|------|
| I Administration. | 1 |
| II Definitions. | 17 |
| III Classification. | 30 |
| IV General Building Restrictions. | 31 |
| V Light and Ventilation. | 42 |
| VI Means of Egress. | 52 |
| VII Materials, Loads and Stresses. | 70 |
| VIII Construction. | 86 |
| IX Safeguards During Construction. | 124 |
| X Fire Protection and Fire Prevention. | 135 |
| XI Chimneys and Flues. | 166 |
| XII Heat Appliances and Forced Draft Systems. | 179 |
| XIII Theatres and Other Special Occupancies. | 198 |
| XIV Elevators. | 206 |
| XV Miscellaneous Equipment. | 211 |
| XVI Electrical Control. | 215 |
| XVII Fire Extinguishing Equipment. | 217 |
| XVIII Signs and Billboards. | 228 |
| | |
| APPENDIX | PAGE |
| A Regulations of the National Board of Fire Underwriters. | 233 |
| B Inspected Appliances. | 234 |
| C Standard Fire Test. | 236 |
| D Fire Test Data. | 245 |
| E Standard Specifications, American Society for Testing Materials. | 246 |
| F Wind Pressures. | 249 |
| G Earthquakes. | 250 |
| H Floor Loads for Various Occupancies. | 252 |
| I Brickwork. | 253 |
| J Reinforced Concrete. | 254 |
| K Timber. | 256 |
| L Wooden Shingles. | 271 |
| M Protection Against Termites. | 272 |
| N Footing Design. | 273 |
| O Floor Fillings. | 274 |
| P Theatre Curtain Construction. | 275 |
| Q Permit Fees. | 279 |
| R Additional Powers, Duties and Requirements. | 281 |

LIST OF ILLUSTRATIONS

| FIGURE | PAGE |
|---|------|
| 1 Typical arrangements for fire towers. | 62 |
| 2 Required wall thicknesses. | 99 |
| 3 Required wall thicknesses. | 100 |
| 4 Suggested methods of anchoring roofs in slow-burning construction. | 114 |

| FIGURE | | PAGE |
|--------|---|------|
| 5 | Floor framing around a fireplace. | 116 |
| 6 | Firestopping around chimney and fireplace. | 117 |
| 7 | Arrangement of wooden floor joists in a wall. | 147 |
| 8 | Fire wall and party wall thicknesses. | 151 |
| 9 | Method of firestopping wood furred brick walls. | 154 |
| 10 | Firestopping of partitions. | 155 |
| 11 | Firestopping in exterior walls of frame construction at floor levels. | 155 |
| 12 | Protection of pipe openings through floors. | 156 |
| 13 | Standard chimney construction. | 168 |
| 14 | Time temperature curve. | 238 |
| 15 | Diagram of a rigid metal curtain. | 276 |
| 16 | Method of attaching asbestos smoke roll. | 277 |
| 17 | Method of effecting a smoke seal at side of rigid metal curtain. | 278 |

ARTICLE I

ADMINISTRATION

SECTION 100. SCOPE.

1. **Short title.** This ordinance shall be known and may be cited as "THE BUILDING CODE."

2. **Matter covered.** This ordinance presumptively provides for matters concerning, affecting or relating to the construction, alteration*, repairs*, removal, demolition, equipment, use and occupancy, location and maintenance of buildings* or structures*, erected or to be erected in the municipality*, except in so far as such matters are otherwise provided for in the municipal charter, in other statutes or ordinances, or in rules duly promulgated under the provisions of this ordinance.

NOTE.—The name of the municipality adopting this ordinance should be substituted in this paragraph for the term "municipality". Wherever the term occurs elsewhere in the text it might well be retained so long as the term is defined. See §200—Definitions.

3. **Ordinance remedial.** This ordinance is hereby declared to be remedial, and shall be construed to secure the beneficial interests and purposes thereof, which are public safety, health and welfare, through structural strength and stability, adequate light and ventilation and safety to life and property from fire and hazards incident to the construction, alteration*, repair*, removal or demolition of buildings* or structures*.

4. **All new work to conform.**

(a). No building* or structure* shall hereafter* be constructed, altered*, repaired*, or removed, nor shall the equipment of a building*, structure* or premises be constructed, installed, altered*, repaired* or removed, except in conformity with the provisions of this ordinance.

*See definition, Section 200.

Sections 100—101

(b). No building* or structure* shall be altered* in any manner that would be in violation of the provisions of this ordinance or of any authorized rule or approval of the building-official* made and issued thereunder.

(c). But nothing in this ordinance shall prohibit the raising or lowering of a building* to meet a change of grade in the street* on which it is located, provided that the building* is not otherwise altered*.

5. Use and maintenance. It shall be unlawful to maintain, occupy or use a building* or structure*, or part thereof, that has been erected or altered* in violation of the provisions of this ordinance.

NOTE.—Provision is made in §104 for the issuance of certificates for buildings when ready for use and occupancy.

6. Buildings affected.

(a). The provisions of this ordinance apply to buildings* or structures* on land not devoted or appropriated to streets*, and to constructions, such as vaults, areas* or street encroachments, however placed, that are appurtenant to such buildings* or structures*.

(b). Such provisions shall apply with equal force to municipal, county or state buildings*, as they do to private buildings*, except as may be specifically provided for by statute or ordinance.

SECTION 101. BUILDING OFFICIAL.

1. Appointment.

(a). The office of building-official* is hereby created.

NOTE.—In case provision is made by the municipality's charter or by other statute, for the office, the method of appointment, qualifications and other requirements, this paragraph and as much of the text of the balance of this section (101) as is thus covered, should be omitted to avoid possible inconsistencies.

(b). The building-official* shall be appointed by and under the general control of the mayor. His appointment shall continue during good behavior and satisfactory service. He shall not be removed from office except for

*See definition, Section 200.

cause after full opportunity has been given him to be heard on specific charges.

(c). During temporary absence or disability of the building-official* the mayor shall designate a substitute to act in matters that require prompt official attention.

2. Qualifications. To be eligible to appointment, the building-official* shall have had at least five years experience as an architect, civil engineer or superintendent of construction. He shall be generally informed on the quality and strength of building materials, on the prevailing methods of building construction, on good practice in fire prevention, on the accepted requirements for safe exit facilities, and on the proper installation of plumbing, electric wiring, elevators* and other installations for the safety, comfort and convenience of occupants. He shall be in good health, physically capable of making the necessary examinations and inspections of buildings* in course of construction. He shall not have any interest whatever, directly or indirectly, in the sale or manufacture of any material, process or device entering into or used in or in connection with building construction.

3. Duties. The building-official* shall devote his whole time to the duties of his office. He shall receive applications required by this ordinance, issue permits and furnish the prescribed certificates. He shall examine premises for which permits have been issued and shall make necessary inspections to see that the provisions of law are complied with and that construction is prosecuted safely. He shall enforce all laws relating to the construction, alteration*, repair*, removal, demolition, equipment, use and occupancy, location, and maintenance of buildings* and structures*, except as may be otherwise provided for. He shall, when requested by the mayor or city council, or when the interests of the municipality* so require, make investigations in connection with matters referred to in this ordinance and render written

*See definition, Section 200.

Section 101

reports on the same. For the purpose of enforcing compliance with law, to remove illegal or unsafe conditions, to secure the necessary safeguards during construction, or to require adequate exit facilities in existing buildings* and structures*, he shall issue such notices or orders as may be necessary.

NOTE.—Part time service of a building official is bad policy. If the building operations of the municipality are so limited that they do not require full-time service, the administration of the building code should be assigned to the fire chief or some other appropriate official, until they have developed to a point when full-time service is desirable. The building official should be sufficiently well paid to make other sources of income beside his salary as building official unnecessary.

Comments on additional powers and duties of the building official, and the right of appeal, which may be authorized in certain municipalities, will be found in Appendix R.

4. **Inspections.** Inspections required under the provisions of this ordinance shall be made by the building-official* or a duly appointed assistant; provided that he may accept reports of inspectors of recognized inspection services, after investigation of their qualifications and reliability. But no certificate called for by any provision of this ordinance shall be based on such reports unless the same are in writing and certified by a responsible officer of such service.

NOTE.—Under the provisions of this subdivision advantage may be and should be taken of the expert services of the inspection bureaus of fire insurance underwriters in connection with electric wiring or fuel oil equipments and other heat appliances, of casualty companies in connection with elevators or steam boilers, and of public service corporations in connection with gas-piping and gas appliances, without sacrificing official supervision. Cooperation of this nature materially strengthens control in these matters; it also effects economies in administration.

5. Rules.

(a). For carrying into effect its provisions, the building-official* shall adopt rules as prescribed in this ordinance and consistent therewith, it being the intent

*See definition, Section 200.

of this requirement that the standards of federal or state bureaus, national technical organizations or fire underwriters, as the same may be amended from time to time, shall serve as a guide in fixing the minimum rules of practice under this ordinance.

NOTE.—So long as such rules are merely to carry into effect the statutory provisions, and are not of the nature of new legislation, there should be no doubt of their propriety or legality.

(b). For the purpose of securing for the public the benefits of new developments in the building industry and yet insuring public safety, he shall make or cause to be made investigations, or may accept duly authenticated reports from reliable sources, of new materials or modes of construction, intended for use in the construction of buildings* or structures* in the municipality* which are not provided for in this ordinance, and shall promulgate rules setting forth the conditions under which such materials or modes of construction may be used.

NOTE.—Re test requirements for new materials see §701.

(c). No rule of the building-official* shall become effective until four weeks after notice of intention to adopt it shall have been given in the official paper of the municipality* and until a public hearing on the same shall have been held; provided that said public hearing shall not be necessary unless a request shall have been made for such hearing during the said period of publication. Such rule must be drawn in its proposed form and open to public inspection at the time the notice to adopt is published.

(d). Rules adopted and promulgated as herein provided shall have the same force and effect as provisions of this ordinance.

(e). Any rule may be amended or repealed by the same procedure prescribed for the adoption of new rules.

6. Records.

(a). The building-official* shall keep careful and comprehensive records of applications, of permits issued,

*See definition, Section 200.

Sections 101—102

of certificates issued, of inspections made, of reports rendered, and of notices or orders issued. He shall retain on file copies of all papers in connection with building work so long as any part of the building* or structure* to which they relate may be in existence.

(b). All such records shall be open to public inspection at reasonable hours, but shall not be removed from the office of the building-official*.

7. Reports. The building-official* shall make a report to the mayor once each month, or oftener if requested, including statements of permits and certificates issued, and orders promulgated.

8. Cooperation of other officials. The building-official* may request and shall receive so far as may be necessary, in the discharge of his duties, the assistance and cooperation of the city engineer in fixing grades, of the chief of police in enforcing orders, of the corporation-counsel* in prosecuting violations, and of other city officials.

9. Right of entry.

(a). The building-official*, in the discharge of his duties, shall have authority to enter any building*, structure* or premises at any reasonable hour.

(b). For the purpose of identification he may adopt a badge of office which he shall display on demand; provided that in an emergency, any other method of identification shall be sufficient.

SECTION 102. APPLICATION FOR PERMIT.

1. When required. It shall not be lawful to construct, alter*, remove or demolish, or to commence the construction, alteration*, removal or demolition of a building* or structure* without first filing with the build-

*See definition, Section 200.

ing-official* an application in writing and obtaining a formal permit.

NOTE.—The conditions under which permits are issued, are given in §103.

2. Form.

(a). An application for a permit shall be submitted in such form as the building-official* may prescribe.

(b). Such application shall be made by the owner* or lessee, or agent of either, or the architect, engineer or builder employed in connection with the proposed work. If such application is made by a person* other than the owner in fee, it shall be accompanied by a duly verified affidavit of the owner in fee or the person* making the application that the proposed work is authorized by the owner in fee and that the person* making the application is authorized to make such application.

NOTE.—This affidavit is important to guard against unauthorized and irresponsible persons securing permits.

(c). Such application shall contain the full names and addresses of the applicant and of the owner*, and, if the owner* is a corporate body, of its responsible officers.

(d). Such application shall describe briefly the proposed work and shall give such additional information as may be required by the building-official* for an intelligent understanding of the proposed work.

3. Plans. Applications for permits shall be accompanied by such drawings of the proposed work, drawn to scale, including floor plans, sections, elevations and structural details, as the building-official* may require.

4. Plot diagram. There shall also be filed a plot diagram in a form and size suitable for filing permanently with the permit record, drawn to scale, with all dimensions figured, showing accurately the size and exact location of all proposed new construction, or, in the case

*See definition, Section 200.

Sections 102—103

of demolition, of such construction as is to be demolished, and of all existing buildings* and structures* that are to remain.

NOTE.—The building official should insist that the required plot diagram be carefully prepared. It will serve as a future check against illegal diminution of required open spaces, either by sale of parts of the plot or by the unauthorized erection of additional buildings or structures. See §103-5c.

5. Amendments. Nothing in this section shall prohibit the filing of amendments to an application or to a plan or other record accompanying same, at any time before the completion of the work for which the permit was sought. Such amendments, after approval, shall be filed with and be deemed a part of the original application.

NOTE.—The practice of some municipalities prohibiting amendments to plans when once approved, is unwise and generally unfair. Changes in plans after construction is in progress are frequently necessary. They should not, however, be allowed after the certificate of occupancy (§104) has been issued. In such a case a new formal application for alteration should be made and a permit secured.

6. Repairs. Repairs* to buildings* or structures* may be made without filing an application or obtaining a permit.

NOTE.—Vigilance is required to prevent the making of alterations under the guise of repairs. See and compare the definitions (§200) of "alteration" and "repair."

7. Completion of existing buildings. Nothing in this ordinance shall require changes in the plans, construction or designated use of a building* for which a lawful permit has been heretofore* issued or which has been otherwise lawfully authorized, and the construction of which shall have been actually begun within ninety days after this ordinance becomes effective and which entire building* shall be completed, as authorized, within two years thereafter.

SECTION 103. PERMITS.

1. Action on application. It shall be the duty of the building-official* to examine applications for permits,

*See definition, Section 200.

within a reasonable time after filing. If, after examination, he finds no objection to the same and it appears that the proposed work will be in compliance with the laws and ordinances applicable thereto and the proposed construction or work will be safe, he shall approve such application and issue a permit for the proposed work as soon as practicable. If his examination reveals otherwise, he will reject such application, noting his findings in a report to be attached to the application and delivering a copy to the applicant.

NOTE.—In case of a rejected application, suitable amendments and new plans may be accepted (§102-5) to remove the objections which were the basis of the rejection; after which the permit may be issued.

Permits issued under this code are limited to matters relating to construction, alteration, removal and demolition, so far as specified in §102-1. They do not relieve the applicant of the necessity of securing other approvals or permits required by law or ordinance, as for instance, permits for vaults that extend outside the street line which must ordinarily be obtained from the official in control of streets.

2. **Approval in part.** Nothing in this section shall be construed to prevent the building-official* from issuing a permit for the construction of part of a building* or structure* before the entire plans and detailed statements of said building* or structure* have been submitted or approved, if adequate plans and detailed statements have been presented for the same and have been found to comply with this ordinance.

3. **Permit for removal.** No permit to remove a building* or structure* shall be granted until notice of application thereof shall have been given to the owners* of lots adjoining the lot* upon which said building* or structure* is to be moved and to the owners* of wires or other impediments the temporary removal of which will be necessary, and an opportunity has been given said owners* to be heard upon such application; nor until a bond in an adequate sum has been filed with the mayor to indemnify and save harmless the municipality* for damages.

*See definition, Section 200.

Section 103

4. Conditions of the permit.

(a). All work performed under a permit issued by the building-official* shall conform to the approved* application and plans, and approved* amendments thereof.

(b). The location of all new construction as shown on the approved* plot diagram or an approved* amendment thereof, shall be strictly adhered to.

(c). It shall be unlawful to reduce or diminish the area of a lot* or plot of which a plot diagram has been filed and has been used as the basis for a permit, unless a revised plot diagram showing the proposed change in conditions shall have been filed and approved*; provided that this shall not apply when the lot* is reduced by reason of a street opening or widening or other public improvement.

NOTE.—See §102-4, and note under same.

5. Signature to permit. Every permit issued by the building-official* under the provisions of this ordinance shall have his signature affixed thereto; but this shall not prevent him from authorizing a subordinate to affix such signature.

6. Limitation. A permit under which no work is commenced within six months after issuance shall expire by limitation.

NOTE.—This does not preclude the renewal of a permit if the conditions under which the permit was originally issued have remained unchanged and there has been no change in law or ordinance that would adversely affect the permit.

7. Posting of permit.

(a). A copy of the permit shall be kept on the premises open to public inspection during the prosecution of the work and until the completion of the same.

(b). The building-official* may require a certified copy of the approved* plans to be kept on the premises at all times from the commencement of the work to the completion thereof.

*See definition, Section 200.

(c). The building-official* shall be given at least twelve hours notice of the starting of work under a permit.

8. Revocation. The building-official* may revoke a permit or approval issued under the provisions of this ordinance in case there has been any false statement or misrepresentation as to a material fact in the application or plans on which the permit or approval was based.

NOTE.—Revocation of a permit should not be resorted to except under the conditions specified in this paragraph. Permits should not be revoked on the ground that a provision of law or ordinance, or of an approval has been violated. The procedure in such a case is prescribed in §107 of this ordinance.

SECTION 104. CERTIFICATE OF OCCUPANCY.

1. New buildings. No building* hereafter* erected shall be occupied or used, in whole or in part, until a certificate of occupancy shall have been issued by the building-official* certifying that such building* conforms to the provisions of this ordinance.

NOTE.—The principles underlying the certificate of occupancy, its importance in maintaining lawful conditions and its value to the owner, are discussed in a paper in the "Proceedings of the National Fire Protection Association" for the year 1919.

2. Buildings hereafter altered. No building* hereafter* enlarged or extended, or so altered*, wholly or in part, as to change its classification, and no building* hereafter* altered* for which a certificate of occupancy has not been heretofore* issued, shall be occupied or used, in whole or in part, until a certificate of occupancy shall have been issued by the building-official* certifying that the work for which the permit was issued has been completed in accordance with the provisions of this ordinance; provided that if the occupancy or use of such building* was not discontinued during the work of alteration*, the occupancy or use of the building* shall not continue for more than thirty days after completion of the alteration* unless such certificate shall have been issued.

*See definition, Section 200.

Section 104

3. **Contents of certificate.** In addition to the certification as to compliance with the provisions of this ordinance, the certificate of occupancy shall state the purposes for which the building* may be used in its several parts, the maximum permissible live-loads* on the several floors, the number of individual persons that may be accommodated in the several stories*, in case such number is limited by a provision of law or by the permit, and all special stipulations of the permit, if any.

4. **Temporary occupancy.** Upon request of the holder of a permit, or of the owner*, the building-official* may issue a temporary certificate of occupancy for part of a building*; provided that such temporary occupancy or use would not jeopardize life or property.

NOTE.—A temporary certificate should not be issued if the work remaining to be done to complete the building constitutes a greater fire hazard than would exist in the permissible occupancy after completion.

5. **Issuance and filing.** A certificate of occupancy shall be issued within five days after written application therefor, if the building* at the time of such application shall be entitled thereto. Copies of certificates of occupancy shall be furnished, on request, to persons* having a proprietary interest in the building*.

NOTE.—See §1502-7.

6. **Existing buildings.** Nothing in this ordinance shall require the removal, alteration* or abandonment of, nor prevent the continuance of the use and occupancy of a lawfully existing building*, except as may be necessary for the safety of life or property. Upon written request from the owner*, the building-official* shall issue a certificate of occupancy for an existing building* certifying, after verification by inspection, the occupancy or use of such building*; provided that at the time of issuing such certificate there are no violations of law or orders of the building-official* pending.

7. **Change of occupancy.**

(a). No change of occupancy or use shall be made in a building* hereafter* erected or altered* that is not

*See definition, Section 200.

consistent with the last issued certificate of occupancy for such building, unless a permit is secured. In case of an existing building*, no change of occupancy that would bring it under some special provision of this ordinance shall be made, unless the building-official* finds, upon inspection, that such building* conforms substantially to the provisions of law with respect to the proposed new occupancy and use, and issues a certificate of occupancy therefor.

NOTE.—Re classification of occupancies see §300.

(b). The use of a building* or premises shall not be deemed to have changed because of a temporary vacancy or change of ownership or tenancy. The reestablishment in a building*, after a change of occupancy has been made, of a prior use that would not have been permitted in a new building* of the same type of construction, is prohibited. The change from a specifically prohibited use to another specifically prohibited use shall not be made.

SECTION 105. OTHER CERTIFICATES.

1. For completed structures. Upon the completion of the construction, alteration* or repair* of a structure*, the building-official* shall if so requested by the holder of the permit, issue a certificate to the effect that the structure has been completed in conformity with the provisions of this ordinance, and indicating the use or uses to which the structure* may thereafter be put and to what extent.

2. For completed installations.

When a certificate is specifically required by a provision of this ordinance for an installation, extension, alteration or repair of an elevator* or elevator equipment, plumbing, gas-piping, electric wiring or heating system, it shall be unlawful to use or permit the use of the installation, equipment or appliance to which such provision applies, until the appropriate certificate has been issued.

*See definition, Section 200.

Section 106

SECTION 106. UNSAFE BUILDINGS.

1. Removal or repair of building.

(a). A building* or structure* that may be or shall at any time hereafter* become dangerous or unsafe, shall, unless made safe and secure, be taken down and removed.

(b). A building* or structure* declared structurally unsafe by duly constituted authority may be restored to safe condition; provided that if the damage or cost of reconstruction or restoration is in excess of fifty per cent of the value of the building* or structure* exclusive of foundations, such building*, or structure*, if reconstructed or restored, shall be made to conform with respect to materials and type of construction, to the requirements for buildings* and structures* hereafter* erected; but no change of use or occupancy shall be compelled by reason of such reconstruction or restoration.

2. Notice of unsafe building.

(a). Upon receipt of information that a building* or structure* is unsafe, the building-official* shall make or cause to be made an inspection; and if it is found that an unsafe condition exists, he shall serve or cause to be served on the owner*, or some one of the owners*, executors, administrators, agents, lessees or other persons* who may have a vested or contingent interest in the same, a written notice containing a description of the building* or structure* deemed unsafe, a statement of the particulars in which the building* or structure* is unsafe, and an order requiring the same to be made safe and secure or removed, as may be deemed necessary by him.

(b). If the person* to whom such notice and order is addressed, cannot be found within the city after diligent search, then such notice and order shall be sent by registered mail to the last known address of such person*; and a copy of such notice shall be posted in a

*See definition, Section 200.

conspicuous place on the premises to which it relates. Such mailing and posting shall be deemed adequate service.

3. **Disregard of notice.** If the person* served with a notice or order to remove or repair an unsafe building* or structure* should fail, within a reasonable time, to comply with the requirements thereof, the corporation-counsel* shall be advised of all the facts in the case, and shall institute an appropriate action in the courts to compel a compliance.

4. **Emergency work.** In case there shall be, in the opinion of the building-official*, actual and immediate danger of the falling of a building* or structure* so as to endanger life or property, he shall cause the necessary work to be done to render said building* or structure*, or part thereof, temporarily safe, whether the procedure prescribed in this section has been instituted or not.

5. **Vacating buildings and closing streets.** When a building* or structure* is in an unsafe condition so that life is endangered thereby, the building-official* may order and require the inmates and occupants to vacate the same forthwith. He may, when necessary for the public safety, temporarily close sidewalks, streets*, buildings*, structures* and places adjacent to such building* or structure*, and prohibit the same from being used.

6. **Laborers and materials.** For the purposes of this section, the building-official* may employ such laborers and materials as may be necessary.

7. **Recovery of costs.** The corporation-counsel* shall institute appropriate actions against the owner* of premises where the unsafe building* or structure* was located for the recovery of costs incurred by the building-official* in the performance of emergency work.

*See definition, Section 200.

SECTION 107. VIOLATIONS.

1. Notices.

(a). Whenever the building-official* is satisfied that a building* or structure*, or any work in connection therewith, the erection, construction or alteration*, execution or repair* of which is regulated, permitted or forbidden by this ordinance, is being erected, constructed, altered* or repaired*, in violation of the provisions or requirements of this ordinance, or in violation of a detailed statement or plan submitted and approved thereunder, or of a permit or certificate issued thereunder, he may serve a written notice or order upon the person* responsible therefor directing discontinuance of such illegal action and the remedying of the condition that is in violation of the provisions or requirements of this ordinance.

(b). In case such notice or order is not promptly complied with, the building-official* shall request the corporation-counsel* to institute an appropriate action or proceeding at law or in equity, to restrain, correct or remove such violation, or the execution of work thereon, or to restrain or correct the erection or alteration* of, or to require the removal of, or to prevent the occupation or use of, the building* or structure* erected, constructed or altered*, in violation of, or not in compliance with, the provisions of this ordinance or with respect to which the requirements thereof, or of any order or direction made pursuant to provisions contained therein, shall not have been complied with.

2. **Stopping work.** Whenever in the opinion of the building-official*, by reason of defective or illegal work in violation of a provision or requirement of this ordinance, the continuance of a building operation is contrary to public welfare, he may order, either orally or in writing, all further work to be stopped and may require suspension of work until the condition in violation has been remedied.

3. Penalties.

(a). A person* who shall violate a provision of this

*See definition, Section 200.

ordinance or fail to comply therewith or with any of the requirements thereof, or who shall erect, construct, alter* or repair*, or has erected, constructed, altered* or repaired* a building* or structure*, in violation of a detailed statement or plan submitted and approved thereunder, or of a permit or certificate issued thereunder, shall be guilty of a misdemeanor punishable by a fine of not less than ten dollars nor more than one hundred dollars, or by imprisonment not exceeding six months, or by both such fine and imprisonment, and each day such violation shall be permitted to exist shall constitute a separate offence.

NOTE.—The imposition of penalties is generally regulated in municipal charters or by state law. The provisions of this section should be made consistent with such charter or state law.

(b). The owner* of a building*, structure* or premises, where anything in violation of this ordinance shall be placed or shall exist, and an architect, builder, contractor, agent, person* or corporation employed in connection therewith and who may have assisted in the commission of such violation shall each be guilty of a separate offence and upon conviction thereof shall be fined as herein provided.

4. **Abatement.** The imposition of the penalties herein prescribed shall not preclude the corporation-counsel* from instituting an appropriate action or proceeding to prevent an unlawful erection, construction, reconstruction, alteration*, repair*, conversion, maintenance or use, or to restrain, correct or abate a violation, or to prevent the occupancy of a building*, structure* or premises, or to prevent an illegal act, conduct, business or use in or about any premises.

ARTICLE II DEFINITIONS

SECTION 200. DEFINITIONS.

(a). Unless otherwise expressly stated, the following terms shall, for the purpose of this ordinance, have the meanings indicated in this section.

*See definition, Section 200.

Section 200

(b). Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural the singular.

(c). Wherever terms in the text of this ordinance are marked with an asterisk (*), they shall have the meaning given them in this section, terms consisting of more than one word and defined in this section being hyphenated. When not marked with an asterisk, they shall have their ordinarily accepted meanings or such as the context may imply.

"Alteration," as applied to a building* or structure*, means a change or rearrangement in the structural parts or in the exit facilities; or an enlargement, whether by extending on a side or by increasing in height; or the moving from one location or position to another; the term "alter" in its various modes and tenses and its participial forms, refers to the making of an alteration.

NOTE.—Compare with definition of "repair." See also note under §102-6.

"Amusement-device" means a mechanically operated device which is used to convey persons in any direction as a form of amusement.

NOTE.—For provisions governing amusement devices see Article XIV.

"Apartment" means a room, or a suite of two or more rooms, in a residence-building* occupied* as the home or residence of an individual, family or household.

"Approved," as applied to a material, device or mode of construction, means approved by the building-official* under the provisions of this ordinance, or by other authority designated by law to give approval in the matter in question.

"Approved-masonry" means masonry constructed of brick, stone, concrete, hollow-block*, solid-block*, or other material approved* after test, or a combination of these materials.

NOTE.—For provisions applying to approved masonry see §706-2; §706-3; §806.

*See definition, Section 200.

"Area," as applied to a form of construction, means an uncovered sub-surface space adjacent to a building*;

"Area," as applied to the dimensions of a building*, means the maximum horizontal projected area of the building* at grade*.

NOTE.—Compare with definition of "floor-area."

"Automatic", as applied to a fire door or other opening protective, means normally held in an open position and automatically closed by a releasing device that is actuated by abnormal high temperature or by a pre-determined rate of rise in temperature.

"Basement" means a story* the floor of which is not less than two feet below and the ceiling of which is not less than four feet and six inches above grade*.

NOTE.—The distinction between "basement" and "cellar" should be noted.

"Bearing-wall" means a wall which supports any vertical load in addition to its own weight.

"Building" means a combination of materials to form a construction that is safe and stable, and adapted to permanent or continuous occupancy for residence, business, assembly or storage purposes; the term "building" shall be construed as if followed by the words "or part thereof."

NOTE.—The distinction between "building" and "structure" should be noted.

"Building-line" means the line, established by law, beyond which a building* shall not extend, except as specifically provided by law.

NOTE.—For those municipalities where the "building-line" and the "street-line" are identical without exception this definition may be omitted.

"Building-official" means the officer or other person charged with the administration and enforcement of this ordinance, or his duly authorized representative.

NOTE.—The term "building-official" is here used as a general term, covering the titles "commissioner of buildings", superintendent of buildings", "building inspector", etc., variously used in municipalities. If the appropriate local title is substituted

*See definition, Section 200.

Section 200

for "building-official" throughout this ordinance, this definition may be omitted. It is suggested, however, that the term be retained and the definition amended by adding the words "known as the inspector of buildings", or whatever the title may be.

"Bulkhead" means a structure above the roof of any part of a building* enclosing a stairway*, tank, elevator* machinery or ventilating apparatus, or such part of a shaft* as extends above the roof.

NOTE.—The terms "bulkhead" and "pent-house" are frequently regarded as synonymous. It is important, therefore, to note and observe carefully in the administration of this ordinance the distinction made herein.

"Business-building" means a building* occupied for the transaction of business, for the rendering of professional services, for the display, sale or storage, if not exclusively storage, of goods, wares or merchandise, for the supplying of food, drink or other bodily needs or comforts, or for the performance of work or labor; including among others, office buildings, stores, markets, restaurants, factories, workshops, laboratories.

"Cellar" means a story* the ceiling of which is entirely below or less than four feet six inches above grade*.

NOTE.—The distinction between "cellar" and "basement" should be noted.

"Cement-mortar" means a mixture of one part of cement and not more than three parts of sand, proportioned by volume, with an allowable addition of hydrated lime not to exceed fifteen per cent of the cement by volume.

NOTE.—Tests indicate that the addition of hydrated lime to an extent not exceeding fifteen percent of the volume of the cement, causes the mortar to work more smoothly and increases its impermeability without decreasing its strength.

"Cement-lime-mortar" means a mixture of one part of cement, one part of slaked lime or dry hydrated lime and not more than six parts of sand, proportioned by volume.

"Concrete" means, except when otherwise specifically provided, a mixture of one part of cement and not more

*See definition, Section 200.

than three parts of sand and five parts of coarse aggregate, proportioned by volume.

"Corporation-counsel" means the officer of the municipality* who is charged with the prosecution of actions at law in its behalf.

"Court" means an open, uncovered and unoccupied space within the lot-lines* of a lot*, and includes yard*.

NOTE.—For provisions governing courts, see §506.

"Curb-level" means the elevation of the street grade as fixed by the municipal authorities;

referring to a building, it means the elevation at that point of the street grade that is opposite the center of the wall nearest to and facing the street-line*;

NOTE.—Compare with definition of "grade."

referring to an excavation, it means the elevation at that point of the street grade which is nearest to the point of the excavation under consideration.

NOTE.—For provisions governing excavations, see §801.

"Dead-load" means the weight of walls, partitions, floors, roofs and all other permanent construction of a building*.

"Display-sign" means a structure that is arranged, intended, designed or used as an advertisement, announcement or direction; and includes a sign, sign screen, billboard and advertising devices of every kind.

NOTE.—For provisions governing display-signs, see Article XVIII.

"Dwelling" means a building* occupied* exclusively for residence purposes and having not more than two apartments*, or as a boarding or rooming house serving not more than fifteen persons with meals or sleeping accommodations or both.

NOTE.—Compare with definition of "residence-building."

"Elevator" means a device within or in connection with a building* used for carrying persons or things upward or downward; and includes dumbwaiter, escalator and similar devices;

*See definition, Section 200.

Section 200

“passenger-elevator” means an elevator designed and used for carrying persons;

“freight-elevator” means an elevator designed and used for the carrying of things and such persons only as are necessary for its safe operation or the handling of things carried by it.

NOTE.—For provisions governing elevators, see Article XIV.

“Fire-limits” means that territory or those districts within the municipality* described in this ordinance, in which, with certain specified exceptions, frame-construction* and unprotected-metal-construction* are prohibited.

“Fire-partition” means a wall or partition which subdivides a story* of a building* to restrict the spread of fire or to provide an area of refuge.

NOTE.—For provisions applying to “fire-partitions”, see §1006.

“Fireproof-construction”, as applied to buildings*, means that in which walls are of approved-masonry* or reinforced-concrete*; and the structural members of which have fire-resistance ratings sufficient to withstand the hazard involved in the occupancy, but not less than a 4-hour rating for bearing-walls*, firewalls*, party-walls*, isolated piers, columns, and wall-supporting girders; a 3-hour rating for walls and girders other than already specified, and for beams, floors, roofs and floor-fillings*; and a 2-hour rating for fire-partitions*.

NOTE.—This type of construction corresponds generally with that sometimes called “fully protected” or “fire resistive” construction. Because of the long, well-established and almost universal use of the term “fireproof,” it is thought best to retain that term for the type of construction here defined.

“Firewall” means a wall which subdivides a building* or separates buildings* to restrict the spread of fire, and which starts at the foundation and extends continuously through all stories* to and above the roof.

NOTE.—For provisions applying to firewalls, see §1005.

“Floor-area” means a floor space enclosed by exterior walls, firewalls*, or fire-partitions*, or by a combination of them.

*See definition, Section 200.

"Floor-filling" means floor construction, in fireproof-construction* only, having spans not in excess of eight feet, placed between or resting on steel beams, or steel beams and girders, to serve both as a support of floor loads and as a protection against the spread of fire.

NOTE.—The limitations of this term should be carefully noted. The provisions applying to floor fillings are given in §1002-5.

"Foundation-wall" means a wall or pier below curb-level* serving as support for a wall, pier, column, or other structural part of a building*.

"Frame-construction", as applied to buildings*, means that in which exterior or party-walls* are wholly or partly of wood.

NOTE.—Buildings of exterior masonry veneer or stucco on wooden frame, constituting, wholly or in part, the structural supports of the building or its loads, are frame buildings within the meaning of this definition.

"Freight-elevator"—see "elevator."

"Garage" means a building*, shed or enclosure, or a part thereof, in which a motor vehicle containing volatile inflammable oil in its fuel storage tank, is stored, housed or kept;

NOTE.—Within the meaning of this definition that part of a building which harbors a motor vehicle, of any kind whatever, having gasoline or other volatile inflammable oil, no matter how little or for what purpose, in its fuel storage tank, is a garage, irrespective of the occupancy of other parts of the building. A motor vehicle repair shop would be included in that term, as well as an automobile salesroom, if there is gasoline in the tank of any car.

"private-garage" means a garage*, for not more than three motor vehicles, in which no business or industry connected directly or indirectly with motor vehicles is carried on;

"public-garage" means a garage* not included within the term private-garage*.

"Grade", with reference to a building*, means, when the curb-level* has been established, the mean elevation of the curb-level* opposite those walls that are located on, or parallel with and within fifteen feet of, street-

*See definition, Section 200.

Section 200

lines*; or, when the curb-level* has not been established, or all the walls of the building* are more than fifteen feet from street- lines*, "grade" means the mean elevation of the ground adjoining the building* on all sides.

"Gypsum-mortar" means a mixture of one part of retarded gypsum and not more than two parts of sand, proportioned by weight, to which a fibrous binding material is added when necessary.

"Habitable-room" means a room occupied* by one or more persons for living, eating or sleeping; and includes kitchens serving apartments* or individual households, but does not include bathrooms, water-closet compartments, laundries, serving and storage pantries, corridors, cellars and spaces that are not used frequently or during extended periods.

NOTE.—For the provisions applying to habitable rooms see Article V.

"Heavy-timber-construction", as applied to buildings*, means that in which walls are of brick, concrete*, or reinforced-concrete*; and in which the interior structural elements, including posts, floors, and roof construction, consist of heavy timbers with smooth flat surfaces assembled to avoid thin sections, sharp projections and concealed or inaccessible spaces; and in which wall-supporting girders and structural members of steel or of reinforced-concrete*, if used in lieu of timber construction, have a fire-resistance rating of not less than three hours.

NOTE.—This type of construction is the same as that called "mill construction" for many years, and sometimes called "slow burning construction."

"Height," as applied to a building*, means the vertical distance from grade* to the highest point of such building*;

"height", as applied to a court*, means the vertical distance from the level of the floor of the lowest story* served by that court* to the level under consideration;

*See definition, Section 200.

"height", as applied to a story*, means the vertical distance from top to top of two successive tiers of floor beams;

"height", as applied to a wall, means the vertical distance to the top measured from the foundation-wall*, or from a girder or other immediate support of such wall.

"Hereafter" means after the time that this ordinance becomes effective.

"Heretofore" means before the time that this ordinance becomes effective.

"Hollow-block" means a cellular building unit of burnt clay or concrete, the gross cubic content of which is not less than fifty per cent greater than the standard size of brick and the cellular spaces of which are in excess of twenty-five per cent of the gross cubic content of the unit.

"Institutional-building" means a building* in which persons are harbored to receive medical, charitable or other care or treatment, or in which persons are held or detained by reason of public or civic duty, or for correctional purposes; including among others, hospitals, asylums, sanitariums, fire houses, police stations, jails.

"Lime-mortar" means a mixture of one part slaked lime or hydrated lime and not more than four parts of sand, proportioned by volume.

"Live-load" means all loads except dead-load*.

"Lot" means a portion or parcel of land considered as a unit, devoted to a certain use or occupied by a building* or a group of buildings* that are united by a common interest or use, and the customary accessories and open spaces belonging to the same.

NOTE.—This definition is general. It is adequate for the purposes of this code as written. In case the municipality has no zoning ordinance, and it is desired to provide for yards back of residence buildings, as suggested in the note following §506, it would probably be necessary to distinguish a corner lot from lots situated otherwise. In that case a definition of "corner lot" reading as follows, should be inserted here: "Corner-lot" means

*See definition, Section 200.

Section 200

a lot* or such part of a lot* that does not exceed 10,000 square feet in area, of which any two adjacent street-lines*, or, in the case of curved street-lines*, the tangents, at the ends of the arc forming the street-line of the lot*, form an angle of divergence from a straight line of more than 45°.

“Lot-line” means a line dividing one lot* from another, or from a street* or other public space.

“Multifamily-house” means a building* occupied* as the home or residence of individuals, families or households living independently of each other, of which three or more are doing cooking within their apartments*; including tenement house, apartment house, flat.

“Municipality” means the municipal corporation which has adopted this ordinance under due legislative authority.

NOTE.—See note under §100-2.

“Occupied”, as applied to a building*, shall be construed as though followed by the words “or intended, arranged or designed to be occupied”.

“Ordinary-construction”, as applied to buildings*, means that in which the exterior walls are of approved-masonry* or of reinforced-concrete*; and in which the interior structural elements are, wholly or partly, of wood of smaller dimensions than required* for heavy-timber-construction*, or of steel or iron that is not protected as required for fireproof-construction* or semi-fireproof-construction*.

NOTE.—The term “ordinary-construction”, corresponds generally with that variously called “non-fireproof”, “masonry-walls and wooden joists,” or “ordinary masonry” construction.

“Owner” includes his duly authorized agent or attorney, a purchaser, devisee, fiduciary, and a person* having a vested or contingent interest in the property in question.

“Party-wall” means a wall used or adapted for joint use between two buildings*.

“Passageway” means an enclosed hallway or corridor connecting a required* exit to a street* or other open

*See definition, Section 200.

space communicating with a street* when such required* exit does not lead directly to a street*.

"Passenger-elevator"—see "elevator".

"Pent-house" means an enclosed structure, other than a bulkhead*, extending not more than twelve feet above a roof.

NOTE.—Compare with definition of "bulkhead", and see note under same.

"Person" includes corporation and copartnership as well as individual.

"Private-garage"—see "garage".

"Public-building" means a building* in which persons congregate for civic, political, educational, religious, social or recreational purposes; including among others, court houses, schools, colleges, libraries, museums, exhibition buildings, lecture halls, churches, assembly halls, lodge rooms, dance halls, theatres, bath houses, armories, recreation piers.

"Public-garage"—see "garage".

"Reinforced-concrete" means a special portland cement concrete in which steel is embedded in such a manner that the two materials act together in resisting forces.

"Repair" means the replacement of existing work with the same kind of material used in the existing work not including additional work that would affect the structural safety of the building*, or that would affect or change required* exit facilities, or that would affect a vital element of an elevator*, plumbing, gas-piping, wiring or heating installation, or that would be in violation of a provision of law or ordinance.

NOTE.—Compare with definition of "alteration". See also note under §102-6.

"Required" means required by some provision of this ordinance.

"Residence-building", except when classed as an institutional-building*, means a building* in which sleeping accommodations are provided; including among others, dwellings*, tenements, multifamily-houses*, ho-

*See definition, Section 200.

Section 200

tels, lodging houses, dormitories, convents, studios, club houses.

"Self-closing", as applied to a fire door or other opening protective, means normally closed and equipped with an approved* device which will insure closing after having been opened for use.

"Semifireproof-construction", as applied to buildings*, means that in which all walls are of approved-masonry* or of reinforced-concrete*; and the structural members of which have fire-resistance ratings not less than a 4-hour rating for firewalls* and party-walls*; a 3-hour rating for other walls, isolated piers, columns, trusses, and wall-supporting girders; and a 2-hour rating for fire-partitions*, girders not otherwise specified, exposed beams, floors, roofs, and floor-fillings*.

NOTE.—This type of construction corresponds generally with that sometimes called "protected" or "fire safe."

"Shaft" means an enclosed shaftway or space, extending through one or more stories* of a building*, connecting a series of two or more openings in successive floors, or floors and roof.

NOTE.—For the provisions applying to the construction of shafts see §1009.

"Solid-block" means a building unit of burnt clay or of stone, gravel or cinder concrete, the gross cubic content of which is not less than fifty per cent greater than the standard size of brick, and in which there are no cellular spaces exceeding in the aggregate twenty-five per cent of the gross cubic content of the unit.

"Sprinklered" means equipped with an approved* automatic sprinkler system.

NOTE.—For the provisions applying to automatic sprinkler systems, see §1702.

"Stairway" means one or more flights of stairs and the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one story* to another in a building* or structure*.

"Standard-fire-test" means the fire test formulated under the procedure of the American Standards Associa-

*See definition, Section 200.

tion as "American Standard" or as "Tentative American Standard."

NOTE.—The specifications of the standard fire test are given in full in Appendix C.

"Storage-building" means a building* for the housing, except for purely display purposes, of airplanes, automobiles, carriages, railway cars or other vehicles of transportation, for the sheltering of horses, live stock or other animals, or exclusively for the storage of goods, wares or merchandise, not excluding in any case offices incidental to such uses; including among others, garages*, carriage houses, stables, barns, hangars, storage warehouses, freight depots, grain elevators.

"Story" means that part of a building* comprised between a floor and the floor or roof next above; and includes basement* and cellar*.

NOTE.—Within the meaning of this definition that which is frequently referred to as a "half story", is a "story." A mezzanine is also a story though when the area of such a story is small (less than ten percent of the story immediately below it) it might be considered as a gallery. For the specific limitations of "basement" and "cellar" stories see the definitions of those terms. A "pent-house" (see definition) is a story.

"Street" means a highway or thoroughfare dedicated or devoted to public use by legal mapping, user or other lawful manner; and includes avenue, road, alley, lane, boulevard, terrace, concourse, driveway, sidewalk.

"Street-line" means a lot-line* dividing a lot* from a street*.

NOTE.—See note under definition of "building-line".

"Structure" means a combination of materials, other than a building*, to form a construction that is safe and stable; including among others, stadiums, gospel and circus tents, reviewing stands, platforms, stagings, observation towers, radio towers, sheds, coal bins, fences and display-signs*; the term "structure" shall be construed as if followed by the words "or part thereof."

NOTE.—The distinction between "structure" and "building" should be noted. "Structure" is the broader term; "building" is a restricted form of "structure".

*See definition, Section 200.

“Unprotected-metal-construction”, as applied to buildings*, is that in which the structural supports are metal and in which the roofing, and walls or other enclosures are of sheet metal, or other incombustible materials, or of masonry deficient in thickness or otherwise not conforming to approved-masonry*.

“Width”, as applied to a court*, means the minimum average width taken along all sides, including lot-lines*, of the court*, the widths along each side being measured at right angles or normal to and from such side to the opposite side at the point of measurement.

“Writing” includes printing and typewriting.

“Yard” means a court* that extends along the entire length of a lot-line*.

NOTE.—See note following §506.

ARTICLE III CLASSIFICATION

SECTION 300. CLASSIFICATION OF OCCUPANCIES.

1. **Classes designated.** For the purposes of this ordinance, buildings* are classified, with respect to occupancy and use, as public-buildings*, institutional-buildings*, residence-buildings*, business-buildings* and storage-buildings*.

2. **Mixed occupancy.** In case a building* is occupied* for two or more purposes not included in one class, the provisions of this ordinance applying to each class of occupancy shall apply to such parts of the building* as come within that class; and if there should be conflicting provisions, the requirements securing the greater safety shall apply.

3. **Doubtful classification.** In case a building* is not specifically provided for, or where there is any uncertainty as to its classification, its status shall be fixed by a duly promulgated rule giving due regard to safety.

*See definition, Section 200.

SECTION 301. CLASSIFICATION OF CONSTRUCTION.

1. **Types designated.** For the purposes of this ordinance, construction as used in buildings* shall be classified as fireproof-construction*, semifiireproof-construction*, heavy-timber-construction*, ordinary-construction*, frame-construction*, and unprotected-metal-construction*.

2. **Partial compliance.** Nothing in this ordinance shall require full compliance with a type of construction, if, under this ordinance, a less restricted form of construction is permitted; but no building* shall be deemed of a given type of construction unless it conforms with all specific provisions of this ordinance applying to that type.

ARTICLE IV

GENERAL BUILDING RESTRICTIONS

SECTION 400. Zoning restrictions. The restrictions of the zoning ordinance with respect to the location of trades and industries, the use and occupancy of buildings*, the height and bulk of buildings*, and the areas of yards, courts and other open spaces, shall not be deemed to be modified by any provisions of this ordinance; and such restrictions shall be controlling except insofar as this ordinance imposes greater restrictions by reason of the type of construction used, in which case the provisions of this ordinance shall control.

NOTE.—In municipalities where there is no zoning ordinance this section would be omitted.

SECTION 401. FIRE LIMITS.

1. **District established.** The fire-limits* of the municipality* are hereby established as follows:

Beginning at.....
..... to the point of beginning.

NOTE.—The fire limits should include all closely built mercantile and adjoining manufacturing districts and surrounding

*See definition, Section 200.

Section 401

blocks on all sides which constitute an exposure to the district or within which new construction of a mercantile or manufacturing character is developing. When fire limits are made to include more than here indicated, appropriate modifications of the restrictions against alterations in dwellings, may consistently be made in subdivision 3 of this section, provided no change of occupancy is made.

2. Limitations. (a). Except as hereinafter provided in this section, no building* or structure* of frame-construction*, or of unprotected-metal-construction* shall be erected hereafter* within the fire-limits*.

(b). Within the fire-limits*, wooden shingle roofing is prohibited.

3. Alterations.

(a). Within the fire-limits* no building* or structure* of frame-construction* or of unprotected-metal-construction* shall be hereafter* increased in height*.

(b). Within the fire-limits* no building* or structure of frame-construction* or of unprotected-metal-construction* shall be hereafter* extended on any side; unless the construction of such extension conforms to the requirements of this ordinance for new construction; and provided that the area* of the building* as extended shall not exceed the allowable area* for frame-construction*.

(c). Within the fire-limits* no other building* or structure* shall be hereafter* extended on any side by frame-construction* or unprotected-metal-construction*.

(d). Nothing in this section shall prohibit other alterations* within the fire-limits*; provided there is no change of occupancy to a class otherwise prohibited.

4. Moving buildings. No building* of frame-construction* or unprotected-metal-construction* shall hereafter* be moved from without to within the fire-limits*.

5. Location. A building* or structure* shall be deemed to be within the fire-limits* if more than one-third of the area* of such building* or structure* is located therein.

*See definition, Section 200.

6. **Exceptions.** Nothing in this section shall prohibit within the fire-limits* and subject to the specified limitations, the erection of new buildings* or structures*, nor the extension or enlargement of existing buildings* or structures*, of frame-construction* or unprotected-metal-construction*, as follows:

(a). A building* of frame-construction* or of unprotected-metal-construction* occupied* exclusively as a private-garage* or stable, not more than one story in height nor more than seven hundred and fifty square feet in area, located on the same lot with a dwelling*.

(b). Outhouses not more than eight feet in height nor more than one hundred square feet in area; provided the roofs are covered with incombustible or fire-retardant material.

(c). Greenhouses not more than fifteen feet in height erected on the same lot* with and accessory to a dwelling* or a store.

(d). Sheds open on the long side, not more than fifteen feet in height nor more than five hundred square feet in area, with roofs covered with incombustible or fire-retardant material.

(e). Builders' shanties not more than one story in height, for use only in connection with a duly authorized building operation and located on the same lot* with such building operation, on a lot* immediately adjoining, on an upper floor of the building* under construction, or on a sidewalk shed.

(f). Piazzas or balconies on dwellings*, not exceeding ten feet in width nor extending more than three feet above the second story floor beams; provided that no such structure* shall extend to a lot-line* or be joined to a similar structure of another building*.

(g). Coal tipples, ice houses, material bins, trestles and water tanks, when built of planking and timbers of the dimensions specified for heavy-timber-construction*.

(h). Fences not exceeding ten feet in height.

(i). Display-signs* as elsewhere provided in this ordinance.

*See definition, Section 200.

SECTION 402. FIREPROOF CONSTRUCTION REQUIRED.

1. General.

Every building* exceeding either the height* or area* limitations fixed in this ordinance for semifireproof-construction* shall be of fireproof-construction*.

2. Special occupancies. Asylums, detention buildings, hospitals, jails, nurseries, and theatres hereafter* erected shall be of fireproof-construction*.

SECTION 403. HEIGHT RESTRICTIONS.

1. New buildings.

(a). Except as may be otherwise provided by statute or by this ordinance, no building* hereafter* erected shall exceed in height* the limits fixed in this section.

(b). Each part of a building* included within firewalls* required* to conform to the area* limitations prescribed for its type of construction, shall be limited in height as though such part were a separate building*.

2. Alterations. No building* shall hereafter* be altered* so as to exceed the limits of height* fixed by this section.

3. Public Buildings. For public-buildings* semifireproof-construction* shall not exceed seventy-five feet; ordinary-construction* and heavy-timber-construction* shall not exceed thirty-five feet, provided that churches of such construction may be forty-five feet but not more than two stories*, and that schools of such construction shall be not more than two stories* high; and frame-construction* shall not exceed thirty feet, provided that churches and schools of such construction shall be not more than one story* high.

4. Institutional buildings. For institutional-buildings* semifireproof-construction* shall not exceed seventy-five feet; ordinary-construction* and heavy-timber-construction* shall not exceed two stories* nor thirty-

*See definition, Section 200.

five feet; and frame-construction* shall not exceed one story* nor thirty-five feet.

5. **Residence Buildings.** For residence-buildings*, semifireproof-construction* and heavy-timber construction* shall not exceed seventy-five feet; ordinary-construction* shall not exceed three stories* nor forty-five feet; provided that when the floors immediately over the basement* and over cellars* are of a construction having a fire-resistance rating of not less than two hours, ordinary-construction* may exceed these heights but shall not exceed four stories* nor fifty-five feet; and when in addition, in multifamily-houses* which are subdivided by fire partitions* into floor-areas* not exceeding twenty-five hundred square feet, all other floors have a fire-resistance rating of not less than one hour, ordinary-construction* may be, but shall not exceed, five stories nor sixty-five feet; and frame construction* shall not exceed two stories nor thirty-five feet; provided that dwellings* of such construction shall not exceed three stories*.

6. **Business buildings.** For business - buildings* semifireproof-construction* and heavy-timber-construction* shall not exceed seventy-five feet; ordinary-construction* shall not exceed fifty feet; and frame-construction* shall not exceed twenty-five feet.

7. **Storage buildings.** For storage-buildings* semifireproof-construction* shall not exceed fifty feet; ordinary-construction* and heavy-timber-construction* shall not exceed thirty-five feet; provided that in buildings* which are sprinklered* heavy-timber-construction* may be, but shall not exceed, seventy-five feet; and frame-construction* shall not exceed one story* nor twenty-five feet.

8. **Exceptions.** (a). For the purpose of this section, the following appurtenances shall not be deemed parts of buildings*: church spires, tanks and their supports, bulkheads*, chimneys, and parapets that do not extend more than four feet above the roof surface at their point of contact.

*See definition, Section 200.

(b). For the purpose of this section neither a basement* nor a cellar* shall be deemed a story*.

(c). Outside the fire-limits*, public-buildings*, business-buildings*, or storage-buildings* may, in the discretion of a board consisting of the chief executive officer of the municipality*, the building-official* and the chief of the fire department, be erected to greater heights* than otherwise fixed by this section; provided that the number of stories* to which the type of construction is limited by this section, is not increased thereby.

9. **Unprotected metal construction.** Buildings* of unprotected-metal-construction* shall be not more than one story high; provided that this shall not prohibit mezzanine stories* the aggregate floor area of which does not exceed twenty-five per cent of the area* of the building*.

SECTION 404. AREA LIMITATIONS.

1. **New buildings.** No building* hereafter* erected shall exceed in area* in any story* above grade*, the limits fixed in this section.

2. **Use of firewalls.** No building* shall be limited in area* if it is divided by firewalls* into sections, none of which exceeds the limits of area* fixed in this section for its type of construction.

3. **Alteration.** No building* shall be hereafter* altered* so as to exceed in area* in any story* above grade* the limits fixed in this section; provided that a building* heretofore* erected which already exceeds the limit of area* may, nevertheless, be extended on a side by means of the type of construction prescribed for a building* hereafter* erected, if the existing and new portions are separated by firewalls*.

4. **Fireproof construction.** For public-garages* fireproof-construction* shall not exceed ten thousand square feet.

5. **Semifireproof construction.** For business-buildings* and storage-buildings* semifireproof-construction* shall not exceed ten thousand square feet; provided that

*See definition, Section 200.

fire-partitions* may be used in place of firewalls* in the subdivision of buildings* of greater areas*; provided further that for public-garages* semifireproof-construction* shall not exceed seven thousand five hundred square feet.

6. **Heavy timber construction.** Heavy-timber-construction* shall not exceed six thousand five hundred square feet for buildings* fronting on one street*, nor eight thousand square feet for buildings* fronting on two streets*, nor ten thousand square feet for buildings* fronting on three or more streets*; provided that for public-garages* heavy-timber-construction* shall not exceed six thousand square feet wherever located.

7. **Ordinary construction.** Ordinary-construction* shall not exceed five thousand square feet for buildings* fronting on one street*, nor six thousand square feet for buildings* fronting on two streets*, nor seven thousand five hundred square feet for buildings* fronting on three or more streets*.

8. **Frame construction.** Buildings* of frame-construction* shall not exceed five thousand square feet.

9. **Area modification.**

(a). The limiting areas* fixed in this section may be increased by one hundred per cent when the building* is sprinklered*, and by two hundred per cent when the building* is sprinklered* and does not exceed one story* nor an average of twenty-five feet in height* to the roof, or to a ceiling which is unpierced and has a fire-resistance of not less than one hour.

(b). Outside the fire-limits*, when a hazardous condition is not created thereby, the area* of a public-building*, a business-building* or a storage-building*, not over two stories* high, may be increased in excess of the areas* fixed by this section, in the discretion of a board consisting of the chief executive officer of the municipality*, the building-official* and the chief of the fire department; provided that buildings* of combustible occupancy shall be sprinklered*.

*See definition, Section 200.

SECTION 405. STREET ENCROACHMENTS.

1. **General.** Except as otherwise provided in this section, no part of a building* hereafter* erected or of an enlargement of a building* heretofore* erected shall project beyond a street-line* or a building-line*.

NOTE.—See note under definition of "building-line."

2. **Projections removable.** A part of a building* permitted to project beyond a street-line* or building-line* shall be so constructed that its removal may be made without causing the building* to become structurally unsafe.

3. **Structural support.** No part of a building* hereafter* erected or of an enlargement of a building* heretofore* erected, that is necessary for structural safety, shall project beyond a street-line* or building-line*, but this shall not be deemed to prohibit the projection beyond the street-line* or beyond the building-line* within the street-line*, to the extent of not more than twelve inches, of the footings of street walls; provided such projecting parts of footings are not less than eight feet below curb-level*.

4. **Permissible projections.** Under the conditions prescribed in this section and within the limitations specified herein, the following projections shall be permissible, it being understood that when a building-line* has not been established the street-line* shall control.

NOTE.—The several limitations (amount or percentage of projection beyond the street-line, clearances above the sidewalk or curb-level, dimensions, etc.) specified in this subdivision are to be taken as suggestive only. They should be modified to conform to local policy.

(a). The main cornice, meaning thereby a moulded projection at or near the top of a wall that faces on a street*, may project beyond the building-line* not more than three feet; provided such main cornice is not less than twelve feet above curb-level* at all points.

(b). Cornices of show window and porches, including metal awning covers, may project beyond the building-line* not more than fifteen inches.

*See definition, Section 200.

(c). Mouldings, belt courses, lintels, sills, architraves, pediments and similar projections of a decorative character, may extend beyond the building-line* not more than four inches when they are less than ten feet above curb-level*, and not more than ten inches when they are ten feet or more above curb-level*.

(d). Columns, pilasters and other similar ornamental projections, including their mouldings and bases, erected for esthetic reasons, may project beyond the building-line* not more than twelve inches.

(e). Rustications and quoins may project beyond the building-line* not more than four inches.

(f). Base courses may project beyond the building-line* not more than one and one-fourth per cent of the width of the street* but not more than ten inches in any case; provided they do not extend more than five feet above curb-level*.

(g). No door shall be hung hereafter* so as to project, when fully open, more than twelve inches beyond the building-line*.

(h). Marquises at entrances to buildings* may extend beyond the street-line* and across the sidewalk to the curb line; provided they are not less than ten feet above the curb-level* at all points, and, within the fire-limits*, are constructed of iron and glass or other incombustible materials. They shall be securely supported from the building*, and shall be properly drained. No marquise shall extend along the street wall of a building* for more than fifty per cent of the length of such wall, nor, in any case, more than twenty-five feet, and there shall be a clear distance of not less than four feet between any two marquises on the same building*.

(i). Drop awnings, attached to buildings*, may extend beyond the street-line* but not nearer than eighteen inches to the curb line; provided that, when let down to their full extent, they are not less than eight feet above the sidewalk at all points.

(j). Fire escapes and balconies to fire towers or other required* exits, constructed of steel or other in-

*See definition, Section 200.

Section 405

combustible material, only when required*, may project beyond the building-line* not more than four feet; but no part of such fire escapes or balconies shall be less than ten feet above the sidewalk; provided that nothing in this section shall prevent the use, in connection with permissible fire escapes, of movable stairs to the sidewalk, so arranged that they are more than ten feet above the sidewalk when not in actual use.

NOTE.—For the conditions under which fire escapes are permitted, see §600-3 and §607-7.

(k). Areas* may project beyond the building-line* not more than four feet; provided that every such area* shall be covered over at the street* level by an approved* grating of metal or other incombustible material.

(l). Vaults, entirely below the sidewalk level, may extend beyond the street-line* but not beyond the curb line.

(m). Exterior hose connections for fire extinguishing equipments or fresh air inlets for plumbing systems, hereafter* installed, shall be set inside the building-line*; or in recesses in the street walls when such walls are on the building-line*; or they may project not more than nine inches beyond the building-line* through the street wall at least two feet above the street* level; or they may be placed in the angle made by the street wall with a pilaster or other permissible projection outside the building-line*.

NOTE.—Exterior hose connections and fresh air inlets, unless located as prescribed in this paragraph, become serious obstructions to pedestrian traffic.

5. Limitation. Nothing in this section shall be deemed to authorize a projection beyond the street-line* or building-line* that is prohibited by the zoning ordinance or by other law or ordinance.

6. Permits revocable. Permission, expressed or implied in the provisions of this section, to construct a building* so as to project beyond the street-line* or building-line* is revocable by the municipality* at will.

*See definition, Section 200.

NOTE.—The policy of some municipalities is not to permit any encroachments outside of the street-line. In such cases the entire section would naturally be omitted or replaced by a brief prohibition against projections outside of the street-line. The right of a municipality to permit the use of streets for parts of building construction is questionable. When such encroachments into the street are permitted, it should always be done with the understanding that the encroachments are suffered temporarily, and this paragraph making that permission revocable must be incorporated in the ordinance.

7. **Alterations.** No change or enlargement shall be made to an existing part of a building* now projecting beyond the street-line* or building-line*, except in conformity with the provisions of this section for new construction.

8. **Existing encroachments.** Parts of buildings* which already project beyond the street-line* or building-line* may be maintained as constructed until their removal is directed by the municipality*.

SECTION 406. LOCATION.

No building* or structure* to be occupied* for one or more of the purposes enumerated in this section shall hereafter* be erected, nor shall an existing building* or structure*, or premises, not heretofore* used for one or more of such enumerated uses, hereafter* be altered* or converted to such use, or altered* or converted from one to another of such enumerated uses, except by special permission of the city council after a public hearing:

ammonia, chlorine or bleaching powder manufacture;

boiler making;

cooperage;

crematory;

distillation of coal, wood or bones;

dry cleaning and dry dyeing establishments;

explosives, manufacture, sale, or storage;

fat rendering;

fertilizer manufacture;

glue, size and gelatine manufacture;

lumber yards;

oil cloth or linoleum manufacture;

*See definition, Section 200.

paint, oil varnish or turpentine manufacture;
petroleum, refining or storage;
pyroxylin manufacture;
raw hides or skins, storage, curing or tanning;
saw or planing mill;
slaughtering of animals;
soap manufacture;
starch, glucose or dextrine manufacture;
stock yards;
sulphurous, sulphuric, nitric, or hydrochloric acid
manufacture;
tallow, grease or lard manufacture or refining;
tar distillation or manufacture;
tar roofing or tar waterproofing manufacture.

NOTE.—The purpose of this section is to restrict the establishment of occupancies that are liable to constitute nuisances or serious fire hazards, and to place the control of their location in the hands of the legislative body of the municipality. The list as given here is not necessarily complete; it should be elaborated or changed by the city council as the necessity for changes arises.

When the location of the occupancies listed in this section is regulated by a zoning ordinance, it may be desirable to omit this section.

ARTICLE V

LIGHT AND VENTILATION

SECTION 500. GENERAL.

1. **New buildings.** For the purpose of providing natural light and adequate ventilation, every building* hereafter* erected, shall be constructed, arranged and equipped to conform to the provisions of this article.

2. **Alterations.**

(a). No building* shall hereafter* be altered* nor rearranged so as to reduce the size of a room or the amount of window space to less than that required* for buildings* hereafter* erected; or so as to create an additional room, unless such additional room is made to

*See definition, Section 200.

conform to the requirements for rooms in buildings* hereafter* erected, except that such rooms may be of the same height as existing rooms in the same story*.

NOTE.—The provisions of this subdivision are not retroactive; but it is expected that they will cause a gradual elimination, as alterations or improvements in existing buildings are made, of conditions that are not in accord with the standards of this article. If existing conditions in a particular case constitute a menace of life or health they can be and should be abated by the legal procedure prescribed for such cases.

(b). No building* shall hereafter* be enlarged, nor shall the lot* on which it is located be diminished so that the dimensions of a required* court* shall be less than prescribed for buildings* hereafter* erected.

3. **Buildings on the same lot.** If more than one building* is hereafter* placed on a lot*, or, if a building* is placed on the same lot* with existing buildings*, the several buildings*, may, for the purpose of this article, be considered as a single building*.

4. **Limitation.** Nothing in this article shall be construed to modify the provisions of any other ordinance, or of any rule authorized by law or ordinance, regulating yards*, courts* or other open spaces; but whenever the provisions of this article require greater yards*, courts*, or open spaces than prescribed in such ordinance or rule the provisions of this article shall control.

NOTE.—Zoning ordinances, for other reasons than light and ventilation, frequently prescribe greater unoccupied lot areas than provided by this article, and, of course, must be observed. See §400 and note under same.

SECTION 501. ROOMS.

1. Habitable rooms.

(a). Every habitable-room* shall have one or more windows, opening directly on a street* or on a court* conforming to the requirements of this article.

NOTE.—Re courts see §506; re windows, §502.

(b). Such rooms shall be not less than six feet wide in any part, and shall contain not less than sixty square feet of clear floor area. Such rooms shall have a clear

*See definition, Section 200.

Section 501

height of not less than eight feet for at least sixty square feet of floor area.

(c). It shall be unlawful to divide a habitable-room* or enclose a part thereof by curtains, portieres, fixed or movable partitions, or other contrivances or devices, unless each part of the room so divided or enclosed shall separately conform to the requirements of this section.

2. **Business and workrooms.** Every room occupied* for office, clerical or administrative purposes, and every room occupied* as a store, salesroom, restaurant, market, bakery, hotel or restaurant kitchen, laundry other than one accessory to a dwelling*, factory, workshop, machinery room or boiler room, and every room in a residence-building* not otherwise provided for, shall be provided with one or more windows or ventilating skylights opening directly on a street* or on a court* conforming to the requirements of this article; or such rooms shall be provided with an approved* means of mechanical ventilation as prescribed in this article; or, when the unoccupied space exceeds five hundred cubic feet for each occupant, such room may be ventilated by transoms or other similar devices opening into rooms having windows or skylights opening directly to the outer air as herein prescribed.

NOTE.—Re windows see §502; re ventilating skylights, §504; re mechanical ventilation, §505-2; re courts, §506.

3. **Public buildings.** In public-buildings* every room used as an auditorium or for public assembly, and every other room, except a habitable-room*, that is not provided with windows opening directly on a street* or on a court* as prescribed in this section for business and workrooms, shall be provided with an approved* system of mechanical ventilation as prescribed in this article, unless the space within such room exceeds one hundred and fifty cubic feet for each occupant and windows having an aggregate area of not less than ten per cent of the floor surface, one fifth of which is openable, and opening on a street* or court*, are provided on opposite sides of the room.

*See definition. Section 200.

NOTE.—Re windows see §502; re courts, §506; re mechanical ventilation, §505-3.

4. **Rooms in institutional buildings.** In institutional-buildings* every room shall be provided with natural light by one or more windows opening on a street* or on a court* conforming to the requirements of this article, and with air by windows as required for habitable-rooms* or by an approved* system of mechanical ventilation as prescribed in this article; provided that in jails and other detention buildings the opening on such street* or court* of the windows of cells or similar rooms may be indirect.

NOTE.—Re windows see §502; re courts, §506; re mechanical ventilation, §505-3.

5. **Bathrooms and water-closet compartments.**

(a). Every bathroom in or connected with an apartment* shall be ventilated by one or more windows to a street* or on a court* conforming to the requirements of this article.

(b). Every other bathroom and every room containing one or more water-closets or urinals, shall be ventilated by one or more windows opening on a street* or on a court* conforming to the requirements of this article; or on a vent shaft* which extends to and through the roof or into a court* conforming to the requirements of this article; or by a separate duct of incombustible and non-corrodible material, not less than seventy-two square inches in cross-section, extending independently of any other duct to and above the roof; or by a ventilating skylight; or by an approved* means of mechanical ventilation as prescribed in this article.

NOTE.—Re windows see §502; re courts, §506; re ventilating skylights, §504; re shafts, §504; re mechanical ventilation, §505-4.

6. **Service pantries and storerooms.** Service pantries and storerooms for food, except in dwellings* and in apartments*, shall be ventilated as prescribed in this section for bathrooms.

7. **Alcoves.** No alcove having a floor area exceeding

*See definition, Section 200.

Section 501

thirty-five square feet or a depth exceeding three and one-half feet shall attach to or open on a habitable-room* or room that is required* to have one or more windows, unless such alcove is separately lighted and ventilated by windows as required in this article.

NOTE.—Re habitable rooms see subdivision 1 of this section.

8. Stairways and corridors.

(a). Every stairway*, public hall or corridor in multifamily-houses* and in institutional-buildings* shall have one or more windows opening directly on a street* or on a court* conforming to the requirements of this article. In such stairways* there shall be at least one window for each story* through which it passes.

(b). In such public halls and corridors, there shall be at least one window or ventilating skylight for every twenty feet of their length or fraction thereof, unless a window is placed at the end of such hall or corridor so that it will adequately light the public hall or corridor for its entire length.

(c). Every recess or return, the depth or length of which exceeds twice the width of the hall or corridor, and every part of such a public hall or corridor that is shut off from any other part by a door or doors, shall be deemed a separate hall or corridor within the meaning of this section.

(d). In buildings* not exceeding four stories* in height, a ventilating skylight conforming to the requirements of this article, may be used in lieu of the windows required in a stairway*; provided there is an unobstructed vertical well hole in such stairway* not less in area than one-fourth of the required* glass area of the skylight.

NOTE.—Re windows see §502; re courts, §506; re ventilating skylights, §504.

9. Rooms needing special devices. Unless already provided for by law or duly authorized rules, rooms in which, by reason of use or occupancy, dust, fumes, gases, vapors or other noxious or deleterious impurities tending

*See definition, Section 200.

to injure the health of occupants or to create a fire hazard, exist or develop, shall be provided with an approved* system of ventilation to remove effectually such impurities during occupancy.

NOTE.—See §1204-7.

10. Rooms below grade.

Every room, other than a habitable-room*, the ceiling of which is below or is less than four feet above grade* and which is frequented by the public or in which five or more persons are regularly employed or congregate, shall, unless provided with windows as required for habitable-rooms*, be provided with an approved* means of mechanical ventilation as prescribed in this article.

NOTE.—Re mechanical ventilation see §505-6.

11. Privacy.

(a). In multifamily-houses* hereafter* erected or altered* access shall be had to living rooms, kitchens and bedrooms without passing through a bedroom.

(b). Access without passing through a bedroom shall also be provided to at least one water-closet, unless every bedroom has direct connection with a water-closet or a bathroom having water-closet accommodation.

12. Overcrowding. If a room in a residence-building* is overcrowded the health officer may order the number of persons sleeping or living in said room to be so reduced that there shall be not less than four hundred and eighty cubic feet of air to each adult and three hundred cubic feet of air to each child under twelve years of age occupying such room.

SECTION 502. WINDOWS.

1. Glass area. The aggregate glass area of windows required by this article shall be not less than one-tenth of the floor area of the room served by them; provided that in habitable-rooms* such glass area shall be not less than ten square feet, and in bathrooms it shall be not less than six square feet.

2. Openings.

(a). In habitable-rooms* and in bathrooms such

*See definition, Section 200.

windows shall be so constructed that when fully open the aggregate open space shall be not less than one-twentieth of the floor area of the room served by such windows.

(b). In other rooms the aggregate openable area of windows, doors, transoms and ventilating skylights that open on a street* or on a court* conforming to the requirements of this article shall be not less than one-twentieth of the aggregate floor area of the rooms served thereby.

NOTE.—Re courts see §506.

SECTION 503. VENT SHAFTS.

1. **Size.** Vent shafts* required by this article, shall have a cross-sectional area of not less than one-fifth of a square foot for every foot of height of shaft*, but not less than nine square feet in any case. No such shaft* shall be less than two feet in its least dimension.

NOTE.—Vent shafts must not be confused with courts (see §506) and must not be used as substitutes for courts when the latter are prescribed. This section merely fixes the requirements for one of the permissible methods for ventilating bathrooms, service pantries and storerooms specified in §501-5 and §501-6. Re construction of vent shafts see §1009.

2. **Skylights.** Unless open to the outer air at the top for its full area, such shaft* shall be covered by a skylight having a net area of fixed louvre openings equal to the maximum required* shaft* area.

3. Air ducts.

(a). Such shafts* shall be connected with a street* or court* conforming to the requirements of this article by a horizontal duct or intake at a point below the lowest window opening on such shaft*.

(b). Such duct or intake shall have a minimum unobstructed cross-sectional area of not less than three square feet with a minimum dimension of twelve inches.

(c). The openings to the duct or intake shall be not less than one foot above the bottom of the shaft* and

*See definition, Section 200.

the street* surface or bottom of court*, at the respective ends of the duct or intake.

(d). Such duct or intake shall be constructed of incombustible, non-corrodible material.

SECTION 504. VENTILATING SKYLIGHTS.

Skylights permitted by this article shall have glass areas not less than required for the windows they replace. They shall be equipped with movable sashes or louvres of an aggregate net area not less than required for openable parts in the windows they replace, or with approved* ventilation of equal efficiency.

NOTE.—Re windows see §502.

SECTION 505. MECHANICAL VENTILATION.

1. General.

(a). When mechanical ventilation is required*, or is permitted as an alternative, the system shall be designed and constructed in accordance with generally accepted good practice, to provide the necessary changes of air, but not less than prescribed in this section.

(b). Except as otherwise specifically prescribed by law or in duly promulgated rules, the recommendations of the American Society of Heating and Ventilating Engineers shall be deemed to be generally accepted good practice.

NOTE.—The recommendations of the American Society of Heating and Ventilating engineers, which have been established in cooperation with the U. S. Public Health Service and the U. S. Bureau of Mines, are embodied in that Society's "Guide," volume 9, chapter 26.

See also §1204-7.

2. Business and work rooms. For rooms occupied* for office, clerical or administrative purposes, as stores or sales rooms, as restaurants, public dining rooms in hotels or elsewhere, as factories, workshops or machinery rooms, as bakeries, hotel or restaurant kitchens, laundries other than accessory to dwellings*, or as boiler rooms, the ventilation requirements shall be within the zone of comfort as established by generally accepted good practice.

*See definition, Section 200.

3. **Rooms in public and institutional-buildings.** (a). For auditoriums and other rooms used for assembly purposes, and for classrooms in schools, not less than two cubic feet of air per minute for each square foot of floor shall be provided.

(b). For wards and dormitories of institutional-buildings* not less than one cubic foot of air per minute for each square foot of floor shall be provided.

(c). For rooms not otherwise provided for in this section not less than one cubic foot of air per minute for each square foot of floor shall be provided.

4. **Bathrooms.** For bathrooms and toilet compartments not less than two cubic feet of air per minute for each square foot of floor shall be provided.

5. **Service pantries and storerooms.** For service pantries and storerooms not less than one cubic foot of air per minute for each square foot of floor shall be provided.

6. **Rooms below grade.** For rooms wholly or partly below grade* not less than one and one-half cubic feet of air per minute for each square foot of floor shall be provided.

SECTION 506. COURTS.

1. Width.

(a). Every court* required by this article to serve habitable-rooms* shall have a width*, at any given level, of not less than one-third of the height* of such court*, but not less than six feet.

(b). Every other required* court* shall have a width* at any given level, of not less than one-fourth of the height* of such court*, but not less than six feet.

NOTE.—The provisions of this section apply also to yards, (see definition of "court", §200), when the light and ventilation of rooms is dependent on yards. They do not, however, modify greater widths in yards when a zoning ordinance prescribes them; see §500-4.

2. **Area.** The cross-sectional area of a required* court* shall be not less than one and one-half times the square of its width*.

*See definition, Section 200.

3. **Street widths.** For the purpose of this article a street* shall be deemed a court*. In case such street* is of less width* than required* for a court*, the building* or that part dependent thereon shall be set back from such street* sufficiently to provide the required* width*, considering the street* as part of the court*.

NOTE.—The provisions of this paragraph do not modify set-back requirements of the zoning ordinance; see §500-4.

4. **Intakes.**

(a). Every court* serving one or more habitable-rooms*, that does not open for its full height* on one or more sides on a street* or yard* shall be connected at or near the bottom with a street* or yard* by a horizontal intake or passage. Such intake or passage shall be constructed with walls, floors and ceilings having a fire-resistance rating of not less than two hours in buildings* of fireproof-construction* or semifireproof-construction* and not less than one hour in buildings* of heavy-timber-construction* or ordinary-construction*. They shall have a cross-sectional area of not less than ten square feet. They shall remain fully open at both ends and unobstructed for their full size and length.

NOTE.—For some acceptable forms of construction of floors having a two-hour rating see §1003-3; of floors having a one-hour rating see Note under §810-7; for walls (partitions) having a two-hour rating see §1006-1; for walls (partitions) having a one-hour rating see §1003-4.

(b). Every other court* that does not open for its full height* on one or more sides on a street* or yard* shall be provided with an intake or duct as prescribed in this article for vent shafts*.

NOTE.—Re ducts and intakes to vent shafts see §503-3.

5. **Unobstructed.** Every court* shall remain unobstructed for its required* width* and full height*, except that ordinary window sills or belt courses, projecting not more than four inches from a wall, and drop awnings shall not be deemed obstructions. But this shall not prohibit in the open spaces at the ground level, in the case of residence-buildings* and institutional-buildings*,

*See definition, Section 200.

clothes poles, arbors, garden trellises and other such accessories, and, in the case of dwellings* only, permissible private-garages*.

6. Drainage. The bottom of every court* shall be properly graded and drained, and when required by the building-official* in the interest of public health, shall be paved with concrete or other suitable material and connected with a public sewer.

7. Accessibility. Every court* that is not otherwise accessible at the bottom, shall be made accessible by a door or other means to enable it to be properly cleaned.

NOTE.—No special provisions have been made in this ordinance for yards. These are generally included in zoning ordinances, since such provisions are for the general interests and welfare of the community at large. Courts, as prescribed in this article 5, are for the health and safety of the occupants of the building, and are reasonable, minimum requirements for this purpose. If there is no zoning ordinance, and it is believed that rear yards are desirable, as providing block ventilation, in the interest of public safety and welfare, a section, regulating yards and prescribing the requirements for the same, may be added.

ARTICLE VI

MEANS OF EGRESS.

SECTION 600. APPLICATION OF ARTICLE.

1. New buildings. Buildings* hereafter* erected shall be provided with exit facilities in accordance with the requirements of this article.

2. Alterations. No building* shall hereafter* be altered* so as to reduce the number or capacity of exits to less than required* for buildings* of similar construction and occupancy hereafter erected. Exits hereafter* installed shall conform to the requirements for exits in new buildings*, except when such exits are installed to comply with a specific order of the building-official*.

3. Existing buildings. Every building* heretofore* erected which is not provided with exit facilities as prescribed in this article for new buildings* and in which the existing exit facilities are inadequate for the safety of

*See definition, Section 200.

the occupants, shall be provided with such means of egress as shall be directed in a written order by the building-official*.

NOTE.—The provisions of this article are not retroactive, except as provided in this subdivision and within the limitations specified therein.

SECTION 601. GENERAL.

1. **Kinds of exits.** Exits shall consist of interior stairways*, fire towers, horizontal exits, exterior stairways*, passageways* or doorways, constructed and arranged as specified in this article.

2. Number of occupants.

(a). The dimensions and capacity of exits shall be proportioned to the number of persons to be accommodated.

(b). When the number of persons to be accommodated by the exits is not stated in the application for a permit or is not otherwise fixed, it shall be decided on the basis of the area of the space devoted to a particular purpose, and shall be assumed to be one person for every ten square feet in dance halls, lodge rooms and places of assembly; one person for every fifteen square feet in court rooms, restaurants, classrooms in schools and colleges, and rooms in public-buildings* not otherwise provided for; one person for every twenty-five square feet in stores, markets, lodging houses and reading rooms; one person for every thirty-five square feet in factories and workrooms; one person for every fifty square feet in offices and showrooms; one person for every one hundred square feet in hospitals, asylums, hotels, furnished room houses, and other residence-buildings*; and one person for every one hundred and fifty square feet in warehouses and garages*. For occupancies not herein specified the building-official* shall, by rule, establish the ratio to be assumed.

SECTION 602. NUMBER OF EXITS.

1. **From rooms.** Every room having an area exceeding one thousand square feet or occupied* by more

*See definition, Section 200.

Section 602

than seventy-five persons shall have at least two doorways, remote from each other, each of which either serves as a direct exit or leads to an exit or into other rooms through which there is unobstructed egress to an exit or exits.

2. **Ground floor.** Every floor-area* having direct exit to a street* and occupied* by more than seventy-five persons, shall have at least two means of exit.

3. **Floor areas.** Every story* not having direct exit to a street* shall have at least one interior stairway* or fire tower connected thereto. Every such story* shall have at least one additional exit when it exceeds two thousand five hundred square feet in area.

4. Apartments.

(a). In multifamily-houses* every apartment* that has not direct exit to a street* or to a court* opening on a street*, shall have access to at least one additional exit separated from and independent of the primary interior stairway* or fire tower.

(b). Access to the separate and independent exits may be through the same corridor or hallway; provided that such corridor or hallway is enclosed by and separated from the stairway* exits and other parts of the building* by partitions having a fire-resistance rating of not less than one hour, except as otherwise prescribed when the building* is of fireproof-construction*.

NOTE.—For acceptable forms of partition construction in buildings other than of fireproof construction, see §1003-4.

Re stairway enclosure see §604-2.

5. **Places of assembly.** (a). Every room, gallery, tier or other space used as a place of assembly shall have at least two means of exit.

(b). In buildings* occupied* as places of assembly for seventy-five or more persons for recreation or amusement, each and every room, gallery, tier or other space, where such assembly occurs shall have direct access to separate and independent exits as follows: not less than two exits when six hundred persons or less are accom-

*See definition, Section 200.

modated in such room, gallery, tier or other space; not less than three exits when more than six hundred but not more than one thousand persons are accommodated; and not less than four exits when more than one thousand persons are accommodated.

6. Fire towers required. In buildings* exceeding sixty feet in height*, at least one stairway* shall be a fire tower; provided that in sprinklered* buildings* in which two or more stairways* conforming to the requirements of this article are provided, such fire tower shall not be required unless the building* exceeds one hundred feet in height*.

NOTE.—Re fire towers see §605.

7. Boiler room exits. Every building*, except dwellings*, in which high pressure steam boilers, or apparatus using or producing gas or vapor, are placed below grade*, shall have in addition to the primary interior stairway*, stationary iron ladders or stairs leading directly through a manhole to the street* from the story* in which such boiler room or such apparatus is located, or some other direct exit to the exterior, unless a second separate exit by an enclosed stairway* or a horizontal exit is provided.

SECTION 603. LOCATION.

1. Distance to exits. Exits shall be so located that no point in a floor-area*, room or space served by them is more than one hundred feet distant from an exit, measured along the line of travel; except that when a floor-area* is subdivided into smaller areas, such as rooms in hotels and office buildings, the distance from the door of any room, along an unobstructed hallway, to an exit, shall be not more than one hundred and twenty-five feet.

2. Remoteness. Where separate exits are required* for a floor-area*, they shall be placed as remote from each other as practicable.

3. Uniform distribution. Where more than two exits are required*, they shall be distributed as uniformly as practicable within or around the floor-area*, room or

*See definition, Section 200.

space they are to serve, to effect a rapid discharge of occupants.

4. Outlets.

(a). Every required* stairway*, except in dwellings*, shall lead, either directly or through a passageway* or hallway, to a street*, or to an open space that communicates with a street*.

(b). In buildings* more than two stories* high above grade* with roofs having a pitch of not more than one in four, at least one required* stairway* shall continue to the roof.

(c). In buildings* more than three stories high above grade*, when there are two or more required* stairways*, at least two shall continue to the roof; provided that in case of roofs having a pitch exceeding one in four, such stairways* shall be connected by a communicating hallway in the top story*.

SECTION 604. INTERIOR STAIRWAYS.

1. Construction.

(a). Required* stairways* shall be constructed of incombustible materials throughout, except in buildings* of frame-construction*, and in buildings* of ordinary-construction* not exceeding thirty feet to the floor of the topmost story* and occupied* by not more than forty persons above or below the first story* above grade*.

(b). When treads or landings are of slate, marble, stone or composition, they shall be supported for their entire length and width by solid steel plates at least one-eighth of an inch thick, securely fastened. When stairs are of fireproof-construction* the treads and landings may be solidly supported for their entire length and width by the materials of which such stairs are constructed.

(c). Treads and landings shall be constructed and maintained in a manner to prevent persons from slipping thereon.

2. Enclosures.

(a). In every building* exceeding thirty feet to the

*See definition, Section 200.

floor of the topmost story* or occupied* by more than forty persons above or below the first story above grade* and in multifamily-houses* more than two stories* high, interior required* stairways*, including hallways connecting them to the doorway leading to the outside, shall be enclosed with fire-partitions*.

NOTE.—Re fire partitions see §1006.

(b). In all other buildings*, except dwellings*, interior required* stairways* which are not enclosed in fire-partitions*, shall be enclosed in partitions of wood studs firestopped at every floor with incombustible material and covered on both sides with expanded metal lath and gypsum-mortar* not less than three-quarters of an inch thick, or of other construction having a fire-resistance rating of not less than one hour.

NOTE.—For acceptable forms of construction see §1003-4.

(c). All interior stairways* in buildings* other than dwellings*, connecting two or more stories*, whether required* as exits or not, shall be enclosed as prescribed in this section for the required* stairways* in the building*; provided that when such stairways* do not serve as required* exits and do not connect more than two stories* the enclosure may be of a construction having a fire resistance rating of not less than one hour, in the assembly of which no combustible material shall be used when the building* is of fireproof-construction*; and provided further that an enclosure shall not be required for a flight of stairs from the main entrance floor to the floor next above when such stairs are not a part of a required* stairway*, nor for a flight of stairs in a building* of fireproof-construction*, semifireproof-construction* or a sprinklered* building* of ordinary-construction*, when such stairs connect only one story* with one other story* immediately above or below it.

NOTE.—For acceptable forms of construction having a one-hour rating, see §1003-4.

(d). Openings. No openings except the necessary doorways, shall be permitted in a stair enclosure re-

*See definition, Section 200. .

quired by this section. Such doorway shall be equipped with approved self-closing* fire doors, except that when fire-partitions* are not required* for the enclosure, substantial self-closing* metal or metal covered doors or wooden doors of the flush type of nominal thickness of one and three-eighths inches may be used. This shall not, however, prohibit windows opening to the exterior of the building*.

NOTE.—Re fire doors see Appendix B.

3. Basement stairs. (a). Except in dwellings*, no stair leading up from a lower story* shall be placed under an exit stairway* leading from an upper story*, unless such stair and exit stairway* are enclosed within the lower story* by a fire-partition*, and with an unbroken ceiling construction, having a fire-resistance rating of not less than one hour, on the soffit of the flight through the lowest story* of the stairway* from above.

NOTE.—Re fire partitions see §1006.

(b). In public-buildings* no exit stair or stairway* from a lower story* shall lead to an exit doorway serving an exit stair or stairway* from an upper story*.

(c). No other stair or stairway* from a lower story* shall lead to an exit doorway serving an exit stair or stairway* from an upper story*, unless such stair or stairway* from below is separated at its upper end from the stair or stairway* from above by fire-partitions*.

NOTE.—Re fire partitions see §1006.

4. Moving stairs. Moving stairs, such as escalators, moving downward when serving stories* above the doorway to the exterior of the building* or moving upward when serving stories* below such doorway, and moving stairs moving in the opposite directions which are equipped at the head of each flight with a device for stopping all flight simultaneously, may be used as required* stairways*; provided they conform in all respects, except minimum width, to requirements of this section. The width shall not be less than twenty-four inches, and no credit for additional width shall be al-

*See definition, Section 200.

lowed in determining exit capacity unless the width exceeds forty-four inches.

5. Width.

(a). The minimum unobstructed width of a stairway* serving as a required* exit, except for handrails projecting not more than three and one-half inches into such width, shall be not less than forty-four inches; provided that in dwellings*, multifamily-houses* and storage-buildings*, and in other buildings* occupied* by a single tenant and limited in occupancy to forty persons, such width may be thirty-six inches.

(b). The aggregate width of exit stairways* in any story, except in places of assembly, shall be such that they may accommodate at one time the total number of persons permitted to occupy the largest floor-area* served by such stairways* above that story, on the basis of one person for each three and one-half square feet of floor surface of the halls, landings and stair treads within the stairways*; provided that, when the building* is sprinklered*, the required* aggregate exit capacity may be reduced to two-thirds in buildings* of heavy-timber-construction* or ordinary-construction*, and to one-half in buildings* of fireproof-construction* or semifireproof-construction*; and when horizontal exits are provided in accordance with the requirements of this article, the required* aggregate exit capacity may be reduced to one-third. The term story as used in this paragraph means the space included between two successive levels at which there are exit doors leading into the stairway*.

NOTE.—Re horizontal exits see §606.

(c). In places of assembly, such aggregate width shall be not less than at the rate of twenty-two inches for every one hundred persons to be accommodated by such stairways*.

(d). The hallway or corridor connecting a stairway* with the exit doors leading to the street*, or to a court* or open space communicating with a street*, shall have a clear width of not less than the aggregate required* widths of stairways* served thereby.

*See definition, Section 200.

Section 604

6. Treads and risers.

(a). Treads and risers of required* stairs shall be so proportioned that the product of the width of tread, exclusive of nosing, and the height of riser, in inches, shall be not less than seventy nor more than seventy-five; but risers shall not exceed seven and three-quarter inches in height, and treads, exclusive of nosing, shall be not less than nine and one-half inches wide: provided that in schools the proportion and dimensions of the treads and risers may, in the discretion of the building-official*, be adjusted to suit the age of the pupils for which the school is intended. Treads and risers shall be of uniform width and height in any one flight.

(b). The use of winders is prohibited in required* stairways*.

7. Landings.

(a). No flight of stairs shall have a vertical rise of more than twelve feet between floors or landings; provided that in stairways* serving as exits in public-buildings* such vertical rise shall not exceed eight feet.

(b). The length and width of landings shall be not less than the width of stairways* in which they occur.

(c). In public-buildings* flights of less than four steps shall not be used in stairways*, interior or exterior, fire towers, passageways*, at entrances or elsewhere in connection with required* exits. To overcome lesser differences in level, gradients not exceeding one foot in ten may be used.

8. Handrails.

(a). Except where permitted in aisles, stairs shall have walls or well secured balustrades or guards on both sides.

(b). Such stairs when less than forty-four inches in width shall have handrails on at least one side.

(c). Such stairs when required* to be forty-four inches or more in width shall have handrails on both sides.

*See definition, Section 200.

(d). When the required* width of a flight of stairs exceeds eighty-eight inches, an intermediate handrail, continuous between landings, substantially supported and terminating at the upper end in newels or standards at least six feet high, shall be provided.

9. Space under stairs. Except in dwellings*, the space under stairs built in whole or in part of combustible materials shall be left entirely open and kept clear and free from encumbrance.

SECTION 605. FIRE TOWERS.

Except as herein otherwise specified fire towers shall conform to the requirements of this article for interior stairways*. The enclosing walls shall be of brick or reinforced-concrete* not less than eight inches thick. There shall be no openings in such walls, except for the necessary doors or windows. Access to the stairway* at each story* served by a fire tower shall be by vestibules or outside balconies having solid floors of incombustible materials and provided with substantial railings. Such balconies or vestibules shall adjoin either a street* or a court* not less than ten feet wide nor less than one hundred and fifty square feet in area, and the permissible doors and windows in the enclosing walls shall open on such street* or court*. The balconies or vestibules shall be level with the floors of the building* and the stair landings of the fire tower. Self-closing* fire doors, swinging in the direction of travel from the building to the fire tower, shall be provided at both building and fire tower ends of such balcony or vestibule. The clear width of such connecting balconies and vestibules shall be not less than that required* for hallways.

NOTE.--Fire towers are recommended as one of the best known means of egress. In addition to serving as exits they afford protected facilities for attack of fires by the firemen.

The installation of fire towers is mandatory under certain conditions. See §602-6.

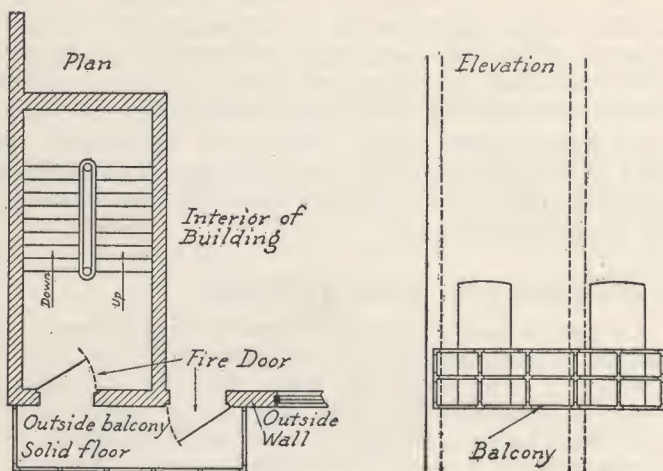
Re interior stairs see §604.

Re hallways see §609.

Re fire doors see Appendix B.

*See definition, Section 200.

Smokeproof Tower with Outside Balcony Entrance



Smokeproof Tower with Vestibule Entrance

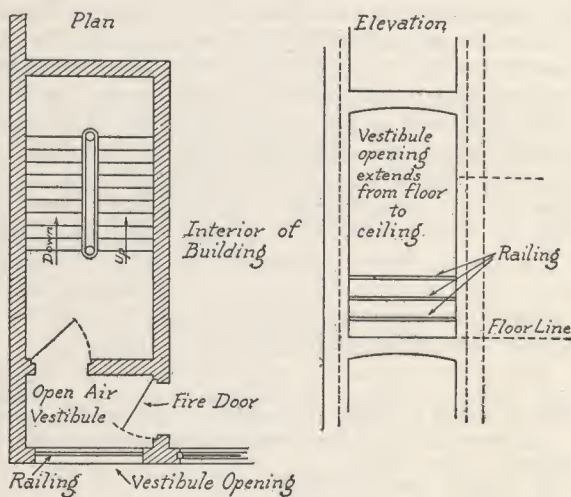


FIG. 1

Typical arrangements for fire towers. No direct communication with building. §605.

SECTION 606. HORIZONTAL EXITS.

1. **General.** Horizontal exits shall consist of vestibules, open air balconies, bridges, or doorways through firewalls* or fire-partitions*, connecting two floor-areas*. This construction and arrangement shall be as prescribed in this section.

NOTE.—Properly designed horizontal exits constitute a most effective means of egress. They are particularly well adapted for hospitals or other occupancies where, in case of emergency, the rapid removal of persons in more or less helpless condition to areas of refuge is necessary or desirable.

Re firewalls see §1005.

Re fire partitions see §1006.

2. **Connected floor areas.** The floor-area* on either side of a horizontal exit shall be sufficient to hold the occupants of both floor-areas*, allowing not less than three and one-half square feet of clear floor space per person.

3. **Stairways.** On each side of a horizontal exit there shall be at least one interior stairway* or fire tower conforming to the requirements of this article, adequate for the number of occupants on either side of such horizontal exit.

NOTE.—Re interior stairways see §604.

Re fire towers see §605.

4. **Vestibules and balconies.** When vestibules or open air balconies are used, they shall conform to the requirements for vestibules or open air balconies of fire towers.

NOTE.—Re fire towers see §605.

5. **Bridges.** When bridges are used they shall be constructed of incombustible material. The clear width of such bridges shall be not less than required* for hallways.

NOTE.—Re hallways see §609.

6. **Openings.** All doorways or windows opening on, under or within ten feet of such vestibules, balconies or bridges shall be equipped with self-closing* fire doors or approved* fire windows.

*See definition, Section 200.

NOTE.—Self-closing doors prevent the passage of smoke through the door opening which might otherwise render the adjoining area of refuge untenable before the heat would operate an automatic door. A self-closing door should never be allowed to be held open, in any manner, longer than necessary to serve the purpose for which it is opened. It should never be held open by mechanical means. See also provision of §1005-2b.

Re fire doors and fire windows see Appendix B.

7. **Gradients.** Where there is a difference in level between the connected floor-areas*, gradients of not more than one foot in ten feet shall be provided. No stairs or steps shall be used in a horizontal exit.

SECTION 607. EXTERIOR STAIRWAYS.

1. **Materials.** Exterior stairs or stairways* hereafter* erected under the provisions of this article, shall be constructed of incombustible materials and shall conform in other respects, except as to enclosure, to the requirements of this article for interior stairways*.

NOTE.—Re interior stairways see §604.

2. **Access.** Each story* served by an exterior stairway*, shall have a doorway equipped with an approved* self-closing* fire door, leading to such stairway*.

NOTE.—Re fire doors see Appendix B.

3. **Openings protected.** All doors and windows opening on or within ten feet of such stairs or stairways* or of fire escapes as hereinafter provided, shall be protected by approved* self-closing* fire doors or approved* fire windows.

NOTE.—Re fire doors and fire windows see Appendix B.

4. **Metal guards.** Unless otherwise enclosed, metal mesh or other rigid guards at least four feet high shall be provided throughout on each unenclosed side of such stairs or stairways*.

5. **Enclosures.** If exterior stairways* are enclosed on any side, such enclosures shall be of approved-masonry* or incombustible materials.

*See definition, Section 200.

6. **Glass.** Glass used in the construction of enclosures shall be wired glass.

7. **Fire escapes.**

(a). Exterior fire escapes which are hereafter* constructed by direction of the building-official* on buildings* heretofore* erected and which, by reason of location or other physical limitations, cannot be constructed to conform fully to the requirements for exterior stairways*, shall, however, be constructed of incombustible materials.

NOTE.—The ordinary so-called "fire escapes" consisting of a series of steel-framed balconies attached to the exterior wall at window openings in the several stories, and connected by narrow and, generally, steep steel ladders or stairs through openings in the floors of the balconies, cannot be regarded as satisfactory exits affording the safety to which the occupants are entitled. They are not recognized in this code as required means of exit. Their use should not be permitted except in extreme cases on existing buildings when additional exits are necessary and conditions do not admit of something better.

This subdivision is applicable only to buildings erected before the adoption of this ordinance and only when ordered by the building official under the provisions of §600-3.

(b). Such fire escapes shall be of sufficient strength to sustain a live-load* of one hundred pounds per square foot on balconies and a concentrated load of four hundred pounds on stair treads.

(c). They shall be so placed that they can be readily and safely reached by the occupants of the building*.

(d). Unless the stair or ladder leading to the ground at the foot of such a fire escape is permanently fixed, the stair or ladder shall be constructed with counterbalancing devices that permit it to be easily and quickly released and placed in rigid position for use.

(e). Such fire escapes shall be so located that safe egress will be provided at the foot of the same to a street* either directly or through a fireproof* passage.

(f). Such fire escapes shall be spacious enough that the movements of those using the fire escape will not be retarded.

*See definition, Section 200.

SECTION 608. PASSAGEWAYS.

1. **Width.** The clear width of passageways* serving as required* exits shall be not less than at the rate of twelve inches for every one hundred persons to be accommodated but not less than five feet in any case.

2. **Height.** Such passageways* shall have a clear height of not less than eight feet.

3. **Openings.** No such passageway* shall serve more than two doorways, or stairways*, or one of each.

4. **Floor.** When the floors of such passageways* are not level, gradients of not more than one foot in ten feet may be used; provided that at a door leading into a passageway* or at the foot of a stairway*, the floor shall be level across the entire width of the passageway* and along its length for a distance of twelve inches more than the width of the door, and for a distance of not less than forty-four inches at the foot of the stairway*.

5. **Enclosure.** The enclosing walls, floors and ceilings of such passageways* shall have a fire resistance rating of not less than two hours, and shall be without openings other than necessary doorways or stairwells.

NOTE.—The fire resistance rating is fixed by the standard fire test. See Appendix C.

SECTION 609. HALLWAYS.

The clear width of every hallway or passage leading to a required* exit shall be not less than at the rate of twelve inches for every one hundred persons to be accommodated but not less than forty-four inches; provided that in dwellings* and multifamily-houses* or in case less than forty persons are to be accommodated, the minimum clear width may be thirty-six inches.

SECTION 610. DOORWAYS.

1. **Width.** No exit doorway shall have a clear width of less than thirty-six inches. The aggregate clear width

*See definition, Section 200.

of doorways serving as exits for more than forty persons shall be not less than at the rate of twenty-two inches for every one hundred persons to be accommodated.

2. Hanging of doors.

(a). The doors of required* doorways shall be so hung and arranged that when opened they shall not in any way diminish or obstruct the required* width of passageway*, hallway, stair, or other means of exit.

(b). Except in residence-buildings* doorways serving as required* exits to a street* or to a court* or open space communicating with a street*, shall have the doors, including the doors of vestibules, so hung as to swing outwards when opening; but this requirement shall not be construed to prohibit the use of doors swinging both inwards and outwards, nor of sliding doors in stables, garages*, or shipping and receiving rooms of business-buildings* and storage-buildings*.

(c). Exit doors leading from rooms occupied* by fifteen or more persons, shall be hung to swing in the direction of exit travel.

(d). No exit door shall open immediately on a flight of stairs, but a landing the length and width of which are not less than the width of such door, shall be provided between such door and such stairs. No riser shall be located within one foot of an exit door.

3. Revolving doors.

(a). Revolving doors, to be acceptable as exit doors, shall have a width equal to that required* for an acceptable swinging door, the width in the case of such a door with rigid braces being the width of a single wing, and in the case of such a door in which the wings may be readily released from one another by pressure so they may swing independently, being the aggregate clear width of the two openings on each side of the central shaft.

(b). Revolving doors shall not be used as exit doors in public-buildings* or institutional-buildings*, nor shall

*See definition, Section 200.

Sections 610—611

they be used as exit doors in buildings* occupied* as stores where more than seventy-five persons are likely to be congregated, unless there are also exit doors of the swinging type, having an aggregate width of at least fifty per cent of required* width of exit doors and there is at least one swinging door adjacent to each revolving door.

4. Door fastenings.

(a). Fastenings on required* exit doors shall be such that the door may be readily opened from the inside without the use of keys; provided that this requirement shall not apply to the doors of rooms where persons are under legal restraint, nor to doors of rooms or floor-areas* while such rooms or floor-areas* are not occupied by any persons.

(b). Draw bolts shall not be used in places of assembly.

SECTION 611. MAINTENANCE.

1. Physical condition. All required* exits and fire escapes shall at all times be maintained in good, safe, usable condition, and shall at all times during occupancy be kept free and clear of obstructions and readily accessible.

NOTE.—In buildings where large numbers of people are employed it is urged that fire drills be organized and practised frequently enough to keep the employees familiar with their operation. The employees should also be taught that when once they have entered an enclosed stairway, or passed through a horizontal exit, they are safe, and can then proceed leisurely to the street with no necessity for undue haste or crowding. Conspicuous notices explaining these facts should be posted in all exit stairways.

2. Exit signs.

(a). Required* exits shall be indicated by suitable lights; provided that exits from floor-areas* occupied* as theatres, dance halls and other places of assembly, and from auditoriums accommodating more than seventy-five persons shall be plainly marked by approved* exit

*See definition, Section 200.

signs, sufficiently illuminated when the floor-area* is occupied, to be readily distinguished.

(b). In buildings* exceeding five thousand square feet in area* one or more floor plans drawn to scale and of sufficient size to be legible, showing the exits and the hallways, passages and aisles leading to the exits, shall be posted in each story* in conspicuous places, at least one for each five thousand square feet of floor-area* or part thereof.

(c). A diagram or plan of each tier, gallery or floor, showing distinctly the exits therefrom, each not less than fifteen square inches in size, legibly printed either in a program or separately, shall be furnished to each person attending a performance in buildings*, auditoriums or places of assembly in which exit signs are required by this section.

(d). The provisions of this subdivision shall not be deemed to apply to dwellings* or multifamily-houses*, nor to auditoriums used solely for religious gatherings.

(e). Enclosed interior stairways* and exterior stairways*, which are provided in or for a building* in addition to the required* stairways* and which do not conform to the provisions of this article for required* stairways*, shall be marked in a suitable manner to indicate that they are not approved* exits, but may be marked to indicate the extent to which they can be used as means of egress.

3. Lighting.

(a). Required* stairways*, passageways*, hallways and other means of exit including exterior open spaces to or through which exits lead, shall be kept adequately lighted at all times that the building* served thereby is occupied.

(b). Artificial lighting shall be provided whenever natural lighting is inadequate.

(c). In auditoriums and assembly halls the lighting shall be such during occupancy that the light intensity at every point thirty inches above the floor is not less than five-tenths of a candle power except during a per-

*See definition, Section 200.

Sections 611—700

formance requiring dimming or darkness; provided that during the showing of motion pictures where it is the practice for patrons to proceed to and from seats at any time such light intensity shall be not less than five-one-hundredths of a candle power.

(d). Lights required to comply with the provisions of this section and lights in public-buildings* that are likely to be or become dangerous in any way to occupants, shall be protected by suitable wire netting or other efficient means against breakage and other hazards.

(e). In public-buildings* and institutional-buildings* the artificial lighting required by this subdivision shall be by electricity so arranged and supplied that the interruption of service on any circuit inside the building* will not result in total interruption of the required* lighting.

4. **Storage prohibited.** No part of a stairway*, whether interior or exterior, nor of a fire tower, nor of a hallway, corridor, vestibule, balcony, or bridge leading to a stairway* or exit of any kind, shall be used for any other than exit purpose.

5. **Radiators.** No coil or radiator, or steam riser shall be placed in a stairway*, passageway*, hallway or other means of exit, nor in an aisle of a floor-area* in which seating accommodation is provided, unless the same be placed in a recess formed in or by the walls or partitions and guarded by substantial metal screen for a height of not less than six feet.

ARTICLE VII

MATERIALS, LOADS AND STRESSES.

SECTION 700. QUALITY OF MATERIALS.

All building materials shall be of a quality to meet the intent of this ordinance, and shall conform to speci-

*See definition, Section 200.

fications, consistent with its requirements, promulgated as rules by the building-official* in accordance with the provisions of this ordinance relating to administration.

NOTE.—For conditions under which rules may be promulgated see §101-5.

For the more generally accepted standard specifications for quality of materials see Appendix E.

SECTION 701. TESTS.

1. **Accepted materials.** In case there is reason to doubt the quality of a material to be used in a building* or structure*, the building-official* may require tests to be made to establish its suitability or to determine whether it conforms to the intent of this ordinance.

2. **New materials, appliances and construction.**

(a). New building materials or materials not otherwise provided for in this ordinance, shall be subjected to such tests, to determine their character and quality, as the building-official* shall direct.

NOTE.—See §101-5b.

(b). Appliances permitted or required by provisions of this ordinance and new methods of construction shall be subjected to such tests to determine their efficiency, as the building-official* shall prescribe.

3. **Conduct of tests.** Tests required under this section shall be conducted under the supervision of the building-official* at a testing laboratory of recognized standing. Duly authenticated tests by a competent person or laboratory may be accepted by him in lieu of tests under his own supervision. So far as practicable test procedure shall be described in rules duly promulgated in accordance with the provisions of this ordinance.

4. **Approvals.** Any material, appliance, or method of construction meeting the requirements of this ordinance or rules authorized thereunder shall be approved by the building-official* within a reasonable time after the completion of the tests. All such approvals and the

*See definition, Section 200.

Section 701

conditions under which they are issued shall be reported and kept on file, open to public inspection.

NOTE.—It would be well to keep the public informed of approvals of materials, devices and forms of construction by publication. An annual report would be a good medium for this purpose.

5. Conditions attaching to approvals.

(a). Materials, appliances or methods of construction which have been tested and approved* shall be used and installed in accordance with the terms of approval.

(b). So far as practicable materials and appliances for which special approvals have been issued shall have a distinctive brand mark for identification impressed on or otherwise attached to them. It shall be unlawful to use any such brand mark on any other material or appliance than that for which the approval was issued.

6. Additional tests. The building-official* may require tests to be repeated, if at any time there is reason to believe that a material or appliance no longer conforms to the requirements on which its approval was based.

NOTE.—A continuing supervision of approved materials, devices and modes of construction to keep them up to standard, is desirable and important.

7. Tests on completed work. In case there is reason to question the safety of a floor or other structural part of a building* or structure* in course of construction or before a certificate of occupancy has been issued, the building-official* may require the owner* or builder to make load tests or other suitable tests to determine the acceptability of the construction. Such tests shall be made under the supervision of the building-official* and shall show that the construction in question will sustain without serious distress a load equal to twice the designed live-load*.

NOTE.—The authority vested in the building official by this subdivision extends only to completed construction, and does not include the right to approve the use of new materials or new modes of construction subject to a test after installation in a building or structure for which a permit is necessary.

*See definition, Section 200.

8. Rejection. Any material, appliance or method of construction failing to conform to the requirements of this ordinance or rules adopted thereunder shall not be used.

SECTION 702. WEIGHTS OF MATERIALS.

For the purpose of estimating dead-loads*, in the absence of more definite information, the weights of building materials in pounds per cubic foot, shall be assumed to be as follows:

| | |
|--|-----|
| Brickwork | 120 |
| Concrete, stone | 144 |
| Concrete, cinder | 108 |
| Gypsum block | 48 |
| Hollow tile, wall bearing | 60 |
| Hollow tile, partition | 54 |
| Plaster, mortar | 96 |
| Granite, bluestone and marble | 168 |
| Limestone | 156 |
| Sandstone | 144 |
| Oak | 48 |
| Southern yellow pine..... | 42 |
| Cypress, larch, short leaf yellow pine and tamarack | 36 |
| Douglas fir, Port Orford cedar, hemlock, redwood, spruce, and white pine..... | 30 |
| Western cedar | 24 |

NOTE.—There is more or less variation in the weights of materials. The figures here given are not to be taken as absolute. They are assumed approximate average weights, in the absence of more definite information, for the purpose of fixing dead loads.

SECTION 703. LOADS.

1. General.

(a). Every building* and structure* shall be designed and erected of sufficient strength in all its parts to sustain safely all live-loads* depending thereon, whether permanent or temporary, in addition to the dead-loads*.

(b). Every temporary support placed in or under a

*See definition, Section 200.

Section 703

building* or structure* shall be of sufficient strength to carry safely the load to be supported thereby.

2. Floor loads. No floor hereafter* erected in a building* shall be designed for less than the following live-loads* per square foot of area uniformly distributed, according as the floor may be intended to be used for the purposes indicated:

40 pounds for habitable-rooms* or other residence purposes;

50 pounds for office, clerical or administrative purposes;

100 pounds for places of assembly or other rooms in public-buildings*, except that for classrooms of schools the floor need not be designed for more than 50 pounds; and

125 pounds for any other purpose.

NOTE.—This subdivision does not relieve the designer or builder of a building or structure from the necessity of providing the necessary strength in the construction to carry the loads that are to be actually imposed. It merely prescribes live loads for less than which no building or structure shall be designed. In Appendix H some actual and probable loads for various occupancies are listed, with notes on the effect of certain load concentrations.

3. Concentrated floor loads. Every floor hereafter* erected in a business-building* or storage-building* shall be designed to sustain safely a load of two thousand pounds placed upon any space two and one-half feet square wherever such load upon an otherwise unloaded floor would produce stresses greater than the uniformly distributed load for which the floor is designed.

4. Stairways and passageways.

(a). Stairways*, passageways*, and hallways, aisles or similar spaces that do not constitute parts of floors otherwise provided for, shall be designed to sustain safely live-loads* of not less than 100 pounds per square foot uniformly distributed.

(b). No safe or other concentrated load shall be placed on a stair landing or in a stair hall, nor shall its

*See definition, Section 200.

weight be carried by a beam which also carries the floor of such landing or stair hall.

5. Roof loads.

(a). Every roof hereafter* erected, having a rise of four inches or less per foot of horizontal projection shall be designed to carry safely a vertical live-load* of not less than thirty pounds per square foot of horizontal projection.

NOTE.—Although snow load, which is practically the only live load coming on a flat roof (provision being made in paragraph "d." for other conditions), varies for different geographical sections and, in warmer regions is nil, roofs should, nevertheless, be strong enough to sustain the loads prescribed in this paragraph.

In sections of the country where snow-falls are heavy due allowance should be made for the additional weight on roofs having a slope of less than 45°.

When roofs are used for the gathering of people the provisions of §1302 should be complied with.

(b). Every roof hereafter* erected, having a rise of more than four inches and not more than twelve inches per foot of horizontal projection shall be designed to carry safely a vertical live-load* of not less than twenty pounds per square foot of horizontal projection.

(c). Every roof hereafter* erected, having a rise of more than twelve inches per foot of horizontal projection, shall be designed to carry safely a wind force acting normal to the roof surface, on one slope at a time, of twenty pounds per square foot of such surface.

NOTE.—For other provisions relating to wind loads see §704.

(d). When a roof, in addition to serving as a closure of a building* or structure*, is to be used as a floor, it shall be designed to carry safely the live-load* to be imposed but not less than the minimum live-load* prescribed in this section for floors.

NOTE.—For additional provisions see §1302.

6. Sidewalk loads. For street* surfaces and roofs over vaults and areas* between the curb and building-line*, the live-load* shall be taken at three hundred pounds per square foot uniformly distributed.

*See definition, Section 200.

7. **Yard and court loads.** For yards* and courts* inside the lot lines* the live-loads* shall be taken at not less than one hundred and twenty-five pounds per square foot uniformly distributed.

8. **Reduction in live loads.** Except in buildings* used for storage purposes, in designing a column, girder, truss, wall, pier or foundation, carrying more than one floor, the live-loads* of the floors dependent for support on such column, girder, truss, wall, pier or foundation may be reduced, but shall not be taken at less than the following percentages of the live-load* for which such floors were designed, to wit: one hundred per cent for the topmost floor, ninety per cent for the floor next below the top floor, eighty per cent for the floor next below that, and at correspondingly decreasing percentages for lower floors, but in no case at less than fifty per cent for any floor.

SECTION 704. WIND PRESSURE.

1. **When considered.** All buildings* and structures* shall be designed to resist a horizontal wind pressure on all surfaces exposed to the wind, allowing for wind in any direction, of not less than fifteen pounds per square foot for those portions less than forty feet above ground, and of not less than thirty pounds per square foot for those portions more than forty feet above ground.

NOTE.—The wind pressure (30 pounds per square foot) prescribed in this section may be higher than necessary in some localities. Before a change in the pressures prescribed in this subdivision is made, competent authority should be consulted. See Appendix F.

2. **Stability.** The overturning moment due to wind pressure shall not exceed seventy-five per cent of the moment of stability disregarding live-loads*, unless the building* or structure* is securely anchored to the foundation.

3. **Allowable stresses.**

(a). For combined stresses due to wind and other loads, the working stresses prescribed in this article may

*See definition, Section 200.

be increased thirty-three and one-third per cent; provided the section thus found is not less than that required by the dead-load* and live-loads* alone.

(b). For members carrying wind stresses only, the permissible working stresses may be increased thirty-three and one-third per cent for steel and fifty per cent for reinforced-concrete* or wood.

NOTE.—For working stresses see §706.

SECTION 705. POSTING FLOOR CAPACITIES.

1. **New buildings.** The live-load* for which each floor, or part of a floor, of a business-building* or a storage-building* hereafter* erected is designed and approved* shall be conspicuously posted in that part of the story* to which it applies.

2. **Existing buildings.** In every business-building* or storage-building* heretofore* erected, in which heavy loads or concentrations occur or machinery is introduced, the owner* or occupant shall cause the weight that each floor will safely sustain to be estimated by a competent person and filed with the building-official*, and when accepted by him posted as provided for new buildings*.

3. **Loading restricted.** No person shall place, or cause or permit to be placed, on any floor of a building* or on any part of a structure* a greater load than the approved* or accepted safe load.

SECTION 706. WORKING STRESSES.

1. General requirements.

(a). Every building* or structure* hereafter* erected and all new construction in the alteration* of an existing building* or structure* shall be so designed and constructed that the working stresses fixed in this section are not exceeded. In using these stresses, the effects of all loads and conditions of loading and the influence of all forces, affecting the design and strength of the several parts shall be taken into account.

(b). Higher stresses than herein specified may be used but only if it is clearly established, by test or other

*See definition, Section 200.

satisfactory evidence, that material of a higher grade or a superior workmanship than is generally provided in accepted good practice is to be employed. The use of higher stresses, however, shall not be allowed until a statement, giving the reasons for such permission together with the facts and circumstances on which it is based, is placed on file and made a part of the official record of the permit.

(c). For materials permitted in the construction of buildings* or structures* which are not provided for in this section, the building-official* shall by rule establish working stresses.

NOTE.—For procedure in making rules see §101-5.

2. **Natural stone.** The working stresses in pounds per square inch, on natural stones in compression, shall be taken as follows:

| | |
|-----------------|------|
| Sandstone | 400 |
| Marble | 600 |
| Limestone | 700 |
| Slate | 1000 |
| Granite | 1000 |

3. Masonry.

(a). The working stresses, in pounds per square inch, in masonry in compression shall be taken as follows:

| | WHEN LAID IN | | | |
|---|--------------------------------|-------------------------------|---------------------------|-----------------|
| | Portland Cement- Mortar* | Natural Cement- Mortar* | Cement Lime Mortar* | Lime Mortar* |
| Brickwork (See Note)..... | 175 | 140 | 140 | 75 |
| Hollow walls of brick..... | 125 | 100 | 100 | |
| Ashlar masonry, dressed granite..... | 800 | 640 | 640 | 400 |
| Ashlar masonry, dressed limestone..... | 500 | 400 | 400 | 250 |
| Ashlar masonry, dressed marble..... | 500 | 400 | 400 | 250 |
| Ashlar masonry, dressed sandstone..... | 400 | 320 | 320 | 160 |
| Rubble stone | 140 | 100 | 100 | |
| Hollow-block*, gross area..... | 80 | 70 | 70 | |
| Solid-block*, gross area..... | 125 | 100 | 100 | |
| Concrete*, when portland cement is used..... | | | 250 | |
| Concrete*, when natural cement is used..... | | | 150 | |
| Grout, neat portland cement, in thin layers under bases only | | | 1000 | |

*See definition, Section 200.

NOTE.—In general, the compressive strength of brickwork varies in direct proportion to the strength of the brick. The working stresses here given are for brickwork in which brick having a compressive strength of 2,500 to 4,500 pounds per square inch are used. For masonry of brick having a greater or lesser compressive strength, these values should be changed as suggested in Appendix I.

(b). In walls faced with stone, architectural terra cotta or other approved* facing material, only the backing shall be assumed to take load and the working stress in such backing shall be taken as that prescribed for the type of masonry used as backing; provided that when such facing is stone ashlar bonded with the backing to the extent of twenty per cent, the wall for its entire thickness may be assumed to carry load and the working stress shall be taken as that prescribed herein for the type of masonry used as backing.

4. Reinforced concrete.

(a). The working stresses in pounds per square inch, in reinforced-concrete* construction shall be taken as follows:

| | |
|---|--------|
| Extreme fiber of concrete, in compression..... | 650 |
| Plain concrete in direct compression | 400 |
| Concrete in shear | 40 |
| Concrete in shear, when diagonal tension is resisted by steel | 100 |
| Bond between concrete and steel | 80 |
| Bond between concrete and approved* deformed bars | 100 |
| Steel reinforcement, in tension | 18,000 |
| Cold drawn steel wire, in tension | 20,000 |

In continuous beams the extreme fiber stress in compression in concrete adjacent to supports may be increased fifteen per cent.

NOTE.—The working stresses here given are based on concrete mixtures and workmanship specified in §807. For higher working stresses when permitted under §706-1b the "Handbook of Reinforced Concrete Building Design" of the American Concrete Institute may be consulted. See Appendix J.

(b). In vertically reinforced-concrete* columns hav-

*See definition, Section 200.

Section 706

ing not less than one-half nor more than two per cent of vertical reinforcement secured against lateral displacement by one-quarter-inch steel ties spaced not more than twelve inches apart, the working stresses in pounds per square inch shall be taken at not more than 365 in the concrete and 6,750 in the vertical reinforcement.

(c). In laterally reinforced-concrete* columns having not less than one nor more than four per cent of vertical reinforcement, and reinforced laterally by steel hoops or spirals of not less than one-quarter of the volume of the longitudinal reinforcement, evenly and rigidly spaced not farther apart than one-sixth of the diameter of the enclosed column nor more than three inches, the working stresses in pounds per square inch shall vary with the percentage of vertical reinforcement as follows: for a percent-

| age of | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------|--------|------|-------|-------|-------|--------|
| in the concrete | 580 | 660 | 740 | 820 | 900 | 980 |
| in the steel | ..8700 | 9900 | 11100 | 12300 | 13500 | 14700; |

the percentage of reinforcement being the volume of the steel divided by the volume of the concrete within the hoops or spirals.

(d). In reinforced-concrete* columns, the ratio of length to least side or diameter shall not exceed fifteen; and the least side or diameter shall be not less than twelve inches; provided that for columns supporting not more than one floor or a roof the least side or diameter may be six inches.

(e). In columns of structural steel thoroughly encased in concrete the working stress shall be taken at not more than fifteen thousand pounds per square inch on the structural steel. The encasing concrete shall be not less than three inches thick at every point outside the structural steel and shall be reinforced with not less than one per cent of steel, of which at least fifty per cent shall be disposed in the form of spiral reinforcement or horizontal bands or hoops uniformly spaced. Such reinforcement shall be placed not nearer than one inch to either the structural steel nor the outer surface of the encasing

*See definition, Section 200.

concrete. The ratio of length to least radius of gyration of the structural steel section shall not exceed one hundred and twenty.

5. Steel.

(a). The working stresses, in pounds per square inch, in steel shall be taken as follows:

| | |
|--|--------|
| Tension | 18,000 |
| Compression in short lengths, when lateral deflection is prevented | 18,000 |
| Compression in columns, maximum | 15,000 |
| Extreme fiber stress in flexure, in tension, and in compression when unsupported length is not more than fifteen times the breadth | 18,000 |
| Fiber stress in pins | 27,000 |
| Shear in web plates, maximum | 12,000 |
| Shear in pins and power driven rivets | 13,500 |
| Shear in hand driven rivets and bolts | 10,000 |
| Bearing on pins and power driven rivets in single shear | 24,000 |
| Bearing on pins and power driven rivets in double shear | 30,000 |
| Bearing on hand driven rivets and bolts in single shear | 16,000 |
| Bearing on hand driven rivets and bolts in double shear | 20,000 |

(b). The working stresses, in pounds per square inch of cross-section, for steel columns and struts shall vary with the ratio of unsupported length to least radius of gyration of the section, as follows:

For a ratio of

| | | | | | |
|-----|--------|-----|---------|----|---------|
| 200 | 5,588, | 130 | 9,284, | 90 | 12,414, |
| 190 | 5,989, | 120 | 10,000, | 85 | 12,844, |
| 180 | 6,429, | 115 | 10,376, | 80 | 13,279, |
| 170 | 6,908, | 110 | 10,764, | 75 | 13,714, |
| 160 | 7,431, | 105 | 11,163, | 70 | 14,148, |
| 150 | 8,000, | 100 | 11,571, | 65 | 14,578, |
| 140 | 8,617, | 95 | 11,989, | 60 | 15,000. |

Section 706

For intermediate ratios the working stresses shall be proportioned to those given. For structural members subjected to stress due to dead-loads* or live-loads*, the ratio of one hundred and twenty shall not be exceeded. For members subjected to stresses due only to wind or vibration the ratio of two hundred shall not be exceeded.

NOTE.—The unit values here given for steel columns are derived by the formula of the American Institute of Steel Construction. A more complete table of values, for practical use will be found in that organizations handbook, "Steel Construction," page 174.

(c). The compressive working stress in flanges of beams and girders when the ratio of unsupported length to breadth exceeds fifteen shall be reduced at a uniform rate from 17,950 for the ratio of fifteen, to 11,200 for the ratio of forty.

(d). Combined stress due to flexure and axial stress shall not exceed that allowed for either flexure or axial stress alone.

(e). The shearing working stress in the gross section of webs of built-up girders and rolled shapes shall vary with the ratio of the unsupported distance between flanges or stiffeners, whichever is less, and the thickness of the web, at a uniform rate, from 11,500 when the ratio is fifty to 3,800 when the ratio is one hundred and sixty.

(f). The working stresses, in pounds per square inch, on sections through throat of weld in welded joints shall not exceed the following:

| | |
|--|---------|
| Shear | 11,300, |
| Tension | 13,000, |
| Compression | 15,000, |
| Extreme fiber stress, tension side | 13,000, |
| Extreme fiber stress, compression side | 15,000; |

provided that adequate provision shall be made for bending stresses due to eccentricity, if any, in the disposition of base metal parts.

6. Cast iron.

(a). The working stresses, in pounds per square inch, in cast iron, shall be taken as follows:

*See definition, Section 200.

| | |
|---|--------|
| Direct compression in short blocks | 16,000 |
| Extreme fiber stress in compression | 12,000 |
| Extreme fiber stress in tension | 3,000 |
| Shear | 3,000 |

(b). The working stresses, in pounds per square inch of cross-section, for hollow cast iron columns shall vary with the ratio of unsupported length to least radius of gyration of the section, as follows:

| | | | | |
|----------------|-----|--------|----|--------|
| For a ratio of | 120 | 2,700, | 70 | 6,200, |
| | 110 | 3,600, | 60 | 6,600, |
| | 100 | 4,500, | 50 | 7,000, |
| | 90 | 5,400, | 40 | 7,400, |
| | 80 | 5,800, | 30 | 7,800. |

For intermediate ratios the working stresses shall be proportionate to those given. The maximum ratio here given shall not be exceeded.

(c). Cast iron columns shall not be subjected to tensile stresses.

7. Wood.

(a). The working stresses, in pounds per square inch, in lumber and timber shall be taken as in the following table:

| | Extreme Fiber and Direct Tension | Shear with the Grain | Compression Across the Grain |
|---------------------------------------|--|----------------------------|------------------------------------|
| Cedar: western red..... | 720 | 64 | 200 |
| northern and southern white | 600 | 56 | 175 |
| Port Orford | 880 | 72 | 250 |
| Alaska | 880 | 72 | 250 |
| Cypress: southern | 1,040 | 80 | 350 |
| Douglas fir; coast region.. | 1,200 | 72 | 325 |
| Rocky Mountain region. | 880 | 68 | 275 |
| Fir: balsam | 720 | 56 | 150 |
| golden, noble, silver, white | 880 | 56 | 300 |
| Hemlock: west coast | 1,040 | 60 | 300 |
| eastern | 880 | 56 | 300 |

Section 706

| | | | |
|---|-------|-----|-----|
| Larch: western | 960 | 80 | 325 |
| Oak: red and white | 1,120 | 100 | 500 |
| Pine: southern | 1,200 | 88 | 325 |
| California, Idaho and northern white, Ponderosa and sugar | 720 | 68 | 250 |
| Norway | 880 | 68 | 300 |
| Redwood | 960 | 56 | 250 |
| Spruce: red, white, Sitka.. | 880 | 68 | 250 |
| Englemann | 600 | 56 | 175 |
| Tamarack: eastern | 960 | 76 | 300 |

When timber is used in a wet location or exposed to the weather the working stresses shall be appropriately reduced.

NOTE.—The working stresses here given are for common grade. The use of higher values when a better grade of timber is actually installed is not precluded by the provisions of this paragraph; but the conditions of §706-1b must be complied with. The increases allowed should be proportionate to the quality of the timber used. See Appendix K. Building officials should call for grade-marked timber when the use of higher working stresses is asked.

For tables giving sizes, spacings and spans of joists of various woods for given floor loads, see Appendix K.

(b). The working stresses, in pounds per square inch, of cross-section, for wooden columns shall vary with the ratio of unsupported length to diameter or least side, as follows:

| | For a ratio of 12 or less | 16 | 20 | 25 | 30 | 35 | 40 | 50 |
|--------------------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| Cedar: western red..... | 553 | 538 | 505 | 425 | 304 | 224 | 171 | 110 |
| Douglas fir: | | | | | | | | |
| coast region | 870 | 847 | 796 | 675 | 487 | 358 | 274 | 175 |
| Rocky Mountain | 632 | 617 | 582 | 500 | 365 | 268 | 206 | 132 |
| Hemlock: west coast..... | 712 | 696 | 660 | 573 | 426 | 313 | 240 | 153 |
| Larch: western | 863 | 828 | 752 | 570 | 396 | 291 | 223 | 142 |
| Oak: red and white..... | 790 | 771 | 728 | 625 | 457 | 336 | 257 | 164 |
| Pine: southern | 870 | 847 | 796 | 675 | 487 | 358 | 274 | 175 |
| Redwood | 786 | 754 | 688 | 526 | 365 | 268 | 206 | 132 |
| Spruce: | | | | | | | | |
| red, white and Sitka.... | 632 | 617 | 582 | 500 | 365 | 268 | 206 | 132 |

For intermediate ratios the working stresses shall be proportioned to those given. The maximum ratio here

given shall not be exceeded. When timber is used in a wet location or exposed to the weather the working stresses shall be appropriately reduced.

NOTE.—The working stresses here given are for common grade. See note under preceding paragraph. See also Appendix K.

SECTION 707. SOIL, BEARING CAPACITY.

1. Presumptive capacity.

(a). In the absence of satisfactory tests, the sustaining power per square foot of different soils shall be deemed to be as follows:

| | | | |
|---|--------|-------------------|---------|
| Soft clay | 1 ton | Coarse sand | 4 tons |
| Wet sand | 2 tons | Gravel | 6 tons |
| Firm clay | 2 tons | Soft rock | 8 tons |
| Sand and clay, mixed or in layers | 2 tons | Hardpan | 10 tons |
| Fine, dry sand .. | 3 tons | Medium rock .. | 15 tons |
| | | Hard rock . | 40 tons |

(b). In case a building* or structure* rests partly on rock or hardpan and partly on some other soil, the bearing capacity of the latter shall be taken at not more than one-half of the capacity otherwise assumed.

2. Soil tests. When a doubt arises as to the safe sustaining power of the soil upon which a building* or structure* is to be erected, or it is desired to exceed the presumptive capacity, the building-official* may direct that borings or tests be made by and at the expense of the owner* of the proposed building* or structure* to determine the sustaining power of the soil. Whenever such a test is made the building-official* shall be notified so that he may be present in person or by representative. A complete record of the test shall be filed with the building-official*.

3. Filled ground. No foundation of a building* or structure* shall be placed on filled ground until the building-official* has fixed, by test or inspection, the safe sustaining power that may be assumed.

*See definition, Section 200.

ARTICLE VIII.
CONSTRUCTION

SECTION 800. WORKMANSHIP.

Workmanship in the fabrication, preparation and installation of materials shall conform to generally accepted good practice. Specific provisions of this article shall not be deemed to suspend any requirements of good practice, but shall be regarded as supplementing or emphasizing them, and shall be controlling. The building-official* shall, as may be necessary, promulgate rules in accordance with the provisions of this ordinance embodying the requirements of such generally accepted good practice.

NOTE.—For procedure and conditions in the promulgation of rules see §101-5.

A list of standards and specifications representative of generally accepted good practice in connection with building construction will be found in Appendix E.

SECTION 801. EXCAVATIONS.

1. **General.** Until provision for permanent support has been made, excavations shall be properly guarded and protected to prevent the same from becoming dangerous to life or limb, and, where necessary, shall be sheetpiled and braced to prevent the adjoining earth from caving in, by the person* causing the excavation to be made.

NOTE.—See note under §801-2a.

2. **Support of neighboring buildings and structures.**

(a). When an excavation extends not more than ten feet below curb-level* the owner* of a building* or structure*, the safety of which may be affected by such excavation, shall preserve and protect the same from injury and, when necessary, shall underpin and support the same by proper foundations. For such purpose, he shall

*See definition, Section 200.

be permitted, if necessary, to enter upon the premises where such excavation is being made.

NOTE.—In the inclusion of this subdivision on the support of neighboring buildings and structures, fixing by statute the responsibility for the safety of such buildings and structures during excavation operations, for many years the practice in vogue in New York City and followed by some other municipalities, has been adopted. When no statutory provisions are made, as has been the case in most municipalities in the past, the common law applies in accordance with which an excavator is not responsible for damages to adjoining structures; provided he exercises reasonable care in the prosecution of his work. When there are no structures on land in its natural state adjoining an excavation, the owner of such land is entitled to support. An extended discussion of this subject by Nathan Young, member of the New York bar, will be found in *Engineering News-Record* for April 10, 1930, page 615.

The depth of the excavation at which the excavator's responsibility should start is a matter of local policy; in New York City it is ten feet, in Niagara Falls, New York, it is three feet, the assumed frost-line to which all foundations must go.

(b). When an excavation extends more than ten feet below curb-level* the person* causing such excavation to be made shall, if afforded the necessary consent to enter upon the adjoining land, at his own expense, preserve and protect from injury every building* or structure*, the safety of which may be affected by such excavation and, when necessary, shall underpin and support the same by proper foundations, irrespective of the depth to which the foundations of such building* or structure* may extend. If the necessary consent is not accorded to the person* making the excavation, then it shall be the duty of the person* refusing such license to preserve and protect such building* or structure* from injury and, when necessary, to underpin and support the same by proper foundations; and for that purpose such person* shall, when necessary, be permitted to enter upon the premises where such excavation is being made.

(c). In case there is a party-wall* along a lot-line* of the premises where an excavation is being made, the person* causing the excavation to be made, shall at his own expense, preserve such party-wall* in as safe a condition as it was before the excavation was commenced

*See definition, Section 200.

Sections 801—802

and shall, when necessary, underpin and support the same by proper foundations.

(d). In case a building* or structure* is so located that the curb-level* to which it is properly referred is at a higher level than the curb-level* to which the excavation is referred, such part of the necessary underpinning or foundation as may be due to the difference in the curb-levels*, shall be made and maintained at the joint expense of the owners* of the adjoining premises at that point.

SECTION 802. FOUNDATIONS.

1. **General requirements.** Except when erected upon solid rock or upon walls or piers on the water front, foundation-walls* shall be carried not less than one foot below frost line and shall rest on solid ground or on leveled rock, or on piles or ranging timbers when solid earth or rock is not found; provided that when one-story buildings* of frame-construction*, ordinary-construction* or unprotected-metal-construction* do not exceed seven hundred and fifty square feet in area*, such foundation walls shall not be required.

2. Footings.

(a). Footings consisting of masonry, reinforced-concrete* or steel grillages, shall be provided under foundation-walls* that rest on earth. Footings of wood may be used if they are entirely below permanent water level or if they are thoroughly impregnated with creosote or other approved* preservative.

NOTE.—Compare §808-12d.

(b). Where metal is incorporated in or forms part of a foundation, it shall be protected from rust by paint, asphalt, concrete*, or by such materials and in such manner as may be approved by the building-official*.

3. **Pressure under footings.** For the loads exerting pressure under the footings of foundation-walls* the full dead-loads* and the reduced required* live-loads* on the lowest walls, piers or columns shall be taken.

NOTE.—Re reduced live loads see §703-8.

*See definition, Section 200.

4. Design.

(a). Footings shall be designed that the pressure on the soil per unit of area shall, so far as possible, be uniform under all parts of the building* or structure*.

(b). In proportioning the areas of footings the dead-loads* alone shall be considered; provided that in no case shall the full dead-loads* plus the reduced live-loads* on a footing exceed the bearing capacity of the soil.

NOTE.—This provision is important to guard against injurious, uneven settlement of footings. An example of the application of this provision will be found in Appendix N.

5. Pile foundations.

(a). Piles intended to sustain walls or buildings* shall, when practicable, be driven to a solid bearing. The method of driving shall be such as not to impair their strength. No pile or group of piles shall be loaded eccentrically.

(b). Wooden piles shall be sound and straight timber. The diameter at the point shall be not less than six inches. The diameter at the butt shall be not less than twelve inches.

(c). The safe sustaining power of wooden piles shall be determined by an approved* formula or by test; but no wooden pile shall be loaded in excess of twenty tons.

NOTE.—The following formulas, known as the Engineering News formulas, are generally accepted for determining the safe sustaining power of friction piles, in which p is the safe load in pounds, w is the weight of the hammer in pounds, H is the fall of the hammer in feet, and s is the penetration in inches under the last blow:

when drop hammer is used, $p = 2 wH \div (s + 1)$;

when steam hammer is used, $p = 2 wH \div (s + 0.1)$.

When piles are driven to rock or hardpan the safe sustaining power is that of the pile as a column.

(d). The distance between the centers of wooden piles shall be not less than twenty-four inches. The tops shall be cut off below permanent water level. Capping timbers on piles shall be of heartwood not less than six

*See definition, Section 200.

Section 802

inches thick and properly joined together, with their tops kept below permanent water level.

(e). Wooden piles under frame buildings* built over water, may project above the surface a sufficient amount to raise the building* above the highest water line, and the building* may be placed directly thereon without other foundation.

(f). For piles consisting of steel tubes filled with concrete, the tubes shall have a minimum inside diameter of ten inches and a shell thickness of not less than five-sixteenths of an inch. The ends of each tube shall be faced perpendicular to its axis. Splices shall be of approved* design. Where bed rock or hardpan can be reached within sixty feet, such piles shall not exceed forty times the outside diameter of the tube. For pile lengths in excess of sixty feet, the minimum diameter of eighteen inches shall be used; provided that piles exceeding forty diameters in length may be used if a one per cent reduction in load is made for each diameter in length in excess of forty diameters. For each splice in the length of the tube in excess of one, a five per cent reduction in load shall be made. Such piles shall be driven to rock or hardpan. The load on such piles shall not exceed five hundred pounds per square inch on the concrete and seventy-five hundred pounds per square inch on the steel; provided that in computing the effective area of the steel the outer one-sixteenth inch of thickness shall be deducted from the thickness of the tube. No interior steel reinforcement shall be used.

(g). Concrete piles moulded and cured before driving shall be provided with not less than two per cent, nor more than four per cent of longitudinal reinforcement. The steel shall be so placed that there is not less than one and one-half inches of concrete on all sides. The diameter or lateral dimension of such piles shall be not less than ten inches on the point, and shall average not less than twelve inches throughout the length of the pile for piles up to twenty feet, nor less than fourteen inches for piles up to thirty feet, nor less

*See definition, Section 200.

than fifteen inches for piles up to forty feet. For piles over forty feet in length the diameter or lateral dimension shall be one-thirty-fifth of the length, but no pile shall be required to exceed two feet in diameter or lateral dimension. The maximum allowable load in tons shall not exceed two times the average diameter or least lateral dimension in inches, but shall not exceed forty tons in any case.

(h). Concrete piles cast in place shall be so made and placed as to insure the exclusion of foreign matter and to insure a continuous and full sized pile. Piles shall be driven in such order and with such spacing as to insure against distortion or injury to the finished pile. The average diameter of such piles shall be at least eleven inches and the diameter of the point shall be at least eight inches. The placing of the concrete through water in such piles is prohibited. The length of such piles shall not exceed thirty times the average diameter. The maximum load for such piles shall be thirty tons.

NOTE.—Piles, freshly cast in place, are apt to be injured by driving the core for a new pile too near. Care must be taken in the driving of cast-in-place piles to avoid this.

(i). When concrete piles are not driven to rock or hardpan, they shall be treated as friction piles and their carrying capacities shall be determined by test.

(j). The concrete for concrete piles shall be mixed in the proportion of one part portland cement to not more than two parts clean, coarse sand, and four parts broken stone or gravel of a size passing through a one-inch ring, with only sufficient water to produce a plastic consistency. The concrete as it is placed must be spaded or otherwise agitated to insure uniform consistency and a complete filling of the pipe or mould. The placing of the concrete of a pile, when once started, must continue uninterruptedly till the pipe or mould is entirely filled.

(k). When doubt exists as to the safe sustaining power of piles upon which a building* or structure* is to be supported, the building-official may order a test

*See definition, Section 200.

to be made at the expense of the owner* of the proposed building* or structure* or of the person* causing the piles to be driven. A complete record of every such test shall be filed with the building-official*.

SECTION 803. FOUNDATION WALLS.

1. **Materials.** Foundation-walls* shall be built of approved-masonry*, reinforced-concrete*, or steel encased in masonry; provided that no hollow-blocks* of burnt clay shall be used unless they are vitrified or are salt-glazed except for surfaces in contact with mortar.

2. **Thickness.**

(a). Foundation-walls* shall be of adequate strength and thickness to resist lateral pressures from adjacent earth and to support their vertical loads; but the thickness shall be not less than the thickness of walls supported by them.

(b). If built of rubble stone, the thickness shall be not less than eighteen inches. If built of brick, concrete, hollow-blocks* or solid-blocks*, the thickness shall be not less than twelve inches; provided that when such walls of dwellings* or of other buildings* not exceeding twenty feet in height* do not extend more than five feet below the adjacent ground level, the minimum thickness of solid brick or concrete walls shall be eight inches, and the minimum thickness of hollow walls of brick and walls of hollow-blocks* or solid-blocks* shall be ten inches.

SECTION 804. RETAINING WALLS.

1. **Construction.** Walls built to retain or support adjoining earth or rock shall be constructed of approved-masonry* or reinforced-concrete*.

2. **Hydraulic head.** Unless provision is made to drain off water, a hydrostatic pressure due to a head equal to the height of the wall shall be assumed.

3. **Support.** The pressure on the soil under such

*See definition, Section 200.

walls shall not exceed the safe bearing capacities allowed by this ordinance.

NOTE.—Re soil capacities see §707.

4. **Coping.** Retaining walls shall be properly protected by coping.

SECTION 805. BUILDINGS TO BE ENCLOSED.

Every building*, other than buildings* of frame-construction* or unprotected-metal-construction*, shall be enclosed on all sides with independent walls or party-walls*, of approved-masonry*, reinforced concrete*, or other form of construction having a fire-resistance rating equal to that required* for the exterior walls according to its type of construction. But this shall not preclude the omission of the exterior walls for part of a story* when the use or occupancy of the building* makes such omission necessary or desirable; provided that in such a case, the unenclosed part is separated from the rest of that story* and from the stories* above and below by walls and floors having a fire-resistance rating equivalent to that required* for exterior walls, and that piers, columns, and other structural supports within the unenclosed part shall have a fire-resistance rating of not less than that required* for the exterior walls. Nor shall this preclude the use of windows, show windows and other openings in the exterior walls so far as the use and occupancy of the building* makes them necessary and desirable; provided they are constructed and protected as required* by this ordinance.

NOTE.—Re exterior wall openings see §1008.

SECTION 806. MASONRY.

1. **Materials.** All masonry shall be constructed of approved* materials. Approved-masonry* shall comply with the provisions of this section.

NOTE.—Reinforced concrete is not classed as masonry. See §807.

*See definition, Section 200.

2. Erection.

(a). All masonry shall be protected against freezing for at least forty-eight hours after being set. Unless adequate precautions against freezing are taken, no masonry shall be built when the temperature is below twenty-eight degrees Fahrenheit on a rising temperature or below thirty-two degrees on a falling temperature, at the point where the work is in progress. No frozen materials shall be built upon.

(b). Except when carried independently by girders at each floor, no wall shall be built up more than twenty-five feet in height* in advance of other walls of the building*.

(c). Masonry walls that meet or intersect shall be adequately bonded or anchored. Piers having less than four square feet of cross-sectional area when located at an intersection with a wall shall be bonded into and built as part of that wall.

(d). Every masonry pier supporting a girder, arch or column, or a lintel carrying a wall over an opening of more than ten feet, shall be built of approved-masonry*; provided that isolated piers or posts on the interior of buildings* shall not be built of stone; and provided further that isolated piers shall not be built of hollow-block* masonry in buildings* of fireproof-construction*, semifireproof-construction*, or heavy-timber-construction*.

(e). Isolated piers shall not exceed in height ten times their least dimension.

(f). Door and window openings in walls shall be spanned by well-buttressed arches, or by lintels having bearings proportioned to their loads but not less than five inches.

(g). No masonry shall be supported on wooden girders or other form of wood-construction.

(h). No timber, except nailing blocks not exceeding an ordinary brick in size, shall be placed in masonry walls; provided that in buildings* of ordinary-construction*, timber lintels may be placed over openings, on

*See definition, Section 200.

the inside of the wall, resting at each end not more than two inches on the wall, and chamfered or cut to serve as centres for masonry arches; provided further that this shall not preclude the use, on exterior walls, for decorative purposes only, timber members against the masonry or set into the masonry to no greater extent than permitted in this section for chases.

(i). During erection, walls shall be adequately braced.

3. Brick masonry.

(a). In brick walls at least every sixth course shall be a header course or there shall be at least one full length header in every seventy-two square inches of wall surface. In walls more than twelve inches thick the inner joints of header courses shall be covered with another header course which shall break joints with the course below.

(b). When running bond is used every sixth course shall be bonded into the backing in a substantial manner; or the face and backing brick shall be bonded at frequent intervals with approved* non-corrodible metal wall ties.

NOTE.—See §806-9k.

(c). Underburned bricks shall not be used in any part of a building* or structure* where exposed to the weather, nor in isolated piers, nor in such part of a bearing-wall* above which the wall extends more than forty feet.

(d). Brick laid in cement-mortar* or in cement-lime-mortar* shall be wet immediately before being laid, except in freezing weather, or in the case of very hard or vitrified brick.

(e). Horizontal and vertical joints in brick masonry shall be filled with mortar.

4. Stone masonry.

(a). In stone masonry at least ten per cent of the face area shall consist of header stones having not less

*See definition, Section 200.

Section 806

than four inches of bond into the backing masonry; provided that in rubble stone masonry no header stone shall be less than twelve inches long measured at right angles to the face of the masonry.

(b). Sandstones and other stones showing a pronounced cleavage shall be laid on their natural bed, except for cornices and other projecting members which shall have the grain or bedding planes vertical and at right angles to the face of the masonry.

(c). Except for foundations, rubble stone masonry shall not be used in walls over forty feet in height*.

5. Hollow walls, and hollow block and solid block masonry.

(a). In hollow walls of brick, and in walls and piers of hollow-blocks* or solid-blocks*, suitable provision shall be made at each line of floor beams and wherever load concentrations occur, to insure good bearing and a uniform distribution of load.

(b). When hollow walls of brick, or walls of hollow-blocks* in which the cells of the blocks are laid vertical, are decreased in thickness, the blocks in the top course of the thicker wall shall be filled solidly with masonry or the exposed openings in such top course shall be covered with slabs of hard burned tile or concrete at least one inch in thickness or the openings may be stopped in some other approved* manner.

(c). Hollow units having a greater thickness than eight and one-quarter inches, measured at right angles to the face of the wall, shall not be used in the construction of walls of business-buildings* or storage-buildings*. Where two or more hollow units are used to make up the thickness of a wall, the inner and outer courses shall be bonded at vertical intervals not exceeding two feet, by lapping at least one cell completely over a cell of the unit below.

(d). In hollow walls the parts of same shall be connected by bonds or ties of brick, stone or the material of the wall, or of iron, placed not more than twenty-four inches apart in either direction; but the parts shall

*See definition, Section 200.

not be deemed to act together in the support of loads unless such bonds or ties are of a size and design to fully develop the strength of either part.

(e). Brick facing or lining when used with hollow-block* masonry, shall be bonded to the backing with at least one header course in every six courses of brick, or there shall be at least one full length header in every seventy-two square inches of wall surface.

(f). Hollow clay tile shall not be used in exterior walls unless hard burned or vitrified tile is used, or such walls are covered on those parts that are exposed to the weather with stucco, or with veneer conforming to the provisions of this section.

(g). Hollow walls of brick or walls of hollow-block* or solid-block* masonry shall not be used as bearing-walls* in buildings* or structures* exceeding forty feet in height*.

6. Ashlar facing.

(a). Stone, architectural terra cotta or other approved* material, used for the facing of a wall, shall have a thickness of not less than one-eighth of the height of the unit, but in no case less than three and three-quarter inches.

(b). Stone ashlar facing shall have at least twenty per cent of the superficial area not less than four inches thicker than the remainder of the facing to form bond stones, which shall be uniformly disposed in the wall.

(c). In stone ashlar every stone that is not a bond stone and every stone that projects wholly or in part beyond the face of the wall, shall be securely anchored to the backing with substantial approved* non-corrodible metal anchors.

7. Veneer.

(a). Masonry veneer shall consist of brick, stone, concrete, terra cotta, or other approved* material.

(b). Such veneer shall rest directly upon a founda-

*See definition, Section 200.

Section 806

tion-wall*, or upon other approved-masonry* or reinforced-concrete*.

(c). It shall be securely attached at intervals of not more than sixteen inches vertically and twenty-four inches horizontally, to the wall or, in the case of frame-construction*, to approved* sheathing combined with a weatherproof lining.

(d). Non-corrodible flashing to prevent moisture from penetrating behind the veneer shall be provided at wall openings.

8. Mortar.

(a). In masonry construction, footings, foundation-walls* and rubble stone walls shall be laid in cement-mortar* only.

(b). Hollow walls of brick, hollow-block* or solid-block* masonry, chimneys, backing of walls faced with ashlar, exterior walls in skeleton construction and isolated piers shall be laid in cement-mortar* or cement-lime-mortar*.

(c). All other masonry shall be laid in cement-mortar*, cement-lime-mortar* or lime-mortar*.

9. Wall thicknesses.

(a). The thickness of masonry walls hereafter* erected shall conform to the provisions of this subdivision and shall in all cases, irrespective of other requirements of this ordinance, be sufficient to keep the stresses in the masonry within the working stresses prescribed in this ordinance.

NOTE.—Re working stresses see §706-3. For requirements affecting walls of reinforced concrete see §807-5.

(b). Except as in this subdivision otherwise provided, the thickness of masonry walls, other than fire-walls* and party-walls*, shall be not less than twelve inches for the uppermost thirty-five feet of their height*, and shall increase four inches in thickness for each successive thirty-five feet or fraction thereof measured downward from the top of the wall.

NOTE.—For the thickness of firewalls and party-walls see §1005; of fire partitions, see §1006; of shafts, see §1009.

*See definition, Section 200.

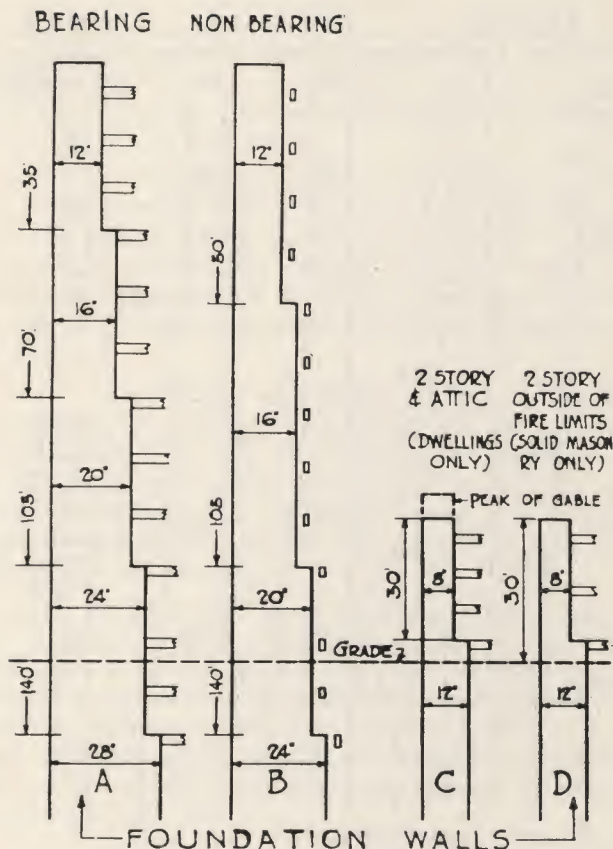


FIG. 2.

Minimum wall thicknesses for residence buildings, institutional buildings, and public buildings: A—masonry bearing walls, §806-9b; B—masonry non-bearing walls, §806-9e; C—masonry walls of dwellings not over thirty feet high nor fifty feet long, §809-9f; D—solid masonry walls of two-story buildings (all classes) outside fire limits, §806-9i; subject to other provisions of §806-9, §803-2, §806-5g and §806-10.

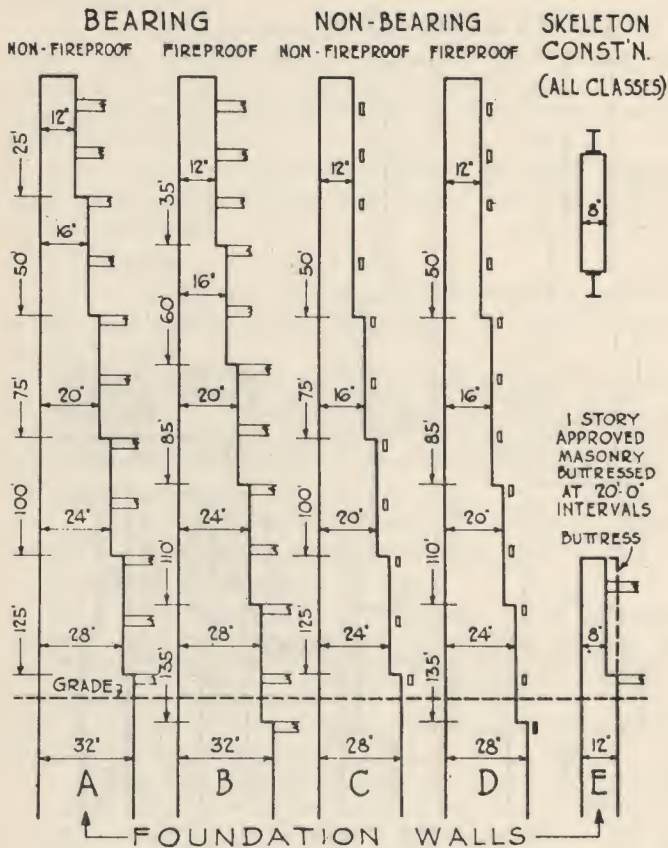


FIG. 3.

Minimum wall thicknesses for business buildings and storage buildings: A—masonry bearing walls, non-fireproof buildings, §806-9c; B—masonry bearing walls, fireproof buildings, §806-9d; C—masonry non-bearing walls, non-fireproof buildings, §806-9e; D—masonry non-bearing walls, fireproof buildings, §806-9e; E—one-story buildings, §806-9h; subject to other provisions of §806-9, §803-2, §806-5g, §806-10 and §1005-1.

(c). In business-buildings* and storage-buildings* of other than fireproof-construction*, the thickness of such walls shall be not less than twelve inches for the uppermost twenty-five feet of their height*, and shall increase four inches in thickness for each successive twenty-five feet or fraction thereof measured downward from the top of the wall.

(d). In business-buildings* and storage-buildings* of fireproof-construction*, the thickness of such walls shall be not less than twelve inches for the uppermost thirty-five feet of their height*, and shall increase four inches in thickness for each successive twenty-five feet or fraction thereof measured downward from the top of the wall.

(e). Non-bearing walls may be four inches less in thickness than otherwise required* for walls; provided that no such wall shall be less than twelve inches thick in any part, unless eight-inch walls are otherwise specifically permitted; and provided further that no twelve-inch thickness shall extend for more than fifty feet in the height of the wall.

(f). In dwellings*, walls including party-walls* but not including rubble stone walls, may be eight inches thick, when such walls are not more than thirty feet in height* nor more than fifty feet in length between cross-walls or adequate buttresses; provided that in a gable wall of a dwelling* the portion of such wall within five feet of the peak need not be considered in fixing the height* of such wall.

(g). Walls supported by girders at each story* may be eight inches thick.

NOTE.—If such walls are to serve as party-walls, they must conform to the provisions of §1005-1d.

(h). Walls of business-buildings* and storage-buildings*, other than firewalls* or party-walls*, not more than one story* high, may be eight inches thick; pro-

*See definition, Section 200.

Section 806

vided they are reinforced at intervals, not exceeding twenty feet, by cross-walls, piers or buttresses.

NOTE.—Re firewalls and party-walls see §1005.

(i). Outside of the fire-limits* solid masonry walls, eight inches thick, may be used for buildings* not exceeding thirty feet nor two stories* in height*, the walls of which, under this ordinance, could be of frame-construction*; provided they do not exceed fifty feet in length between cross-walls, piers or buttresses. Hollow walls of brick or walls of hollow-block* or solid-block* masonry, eight inches thick, may be used when such buildings* do not exceed one story in height*.

(j). The thickness of rubble stone walls shall be four inches more than otherwise required* for walls; provided that no rubble stone wall shall be less than sixteen inches in thickness.

(k). When clip courses or wall ties are used to bond a facing or a lining to a wall, neither such facing or lining shall be regarded as a part of the required* thickness of the wall nor as contributing to its strength.

(l). Walls exceeding one hundred feet in length between cross-walls, piers or buttresses, shall be not less than sixteen inches thick; but face-brick, bonded to the backing by clip courses, may be included in the thickness of the wall for the purpose of this paragraph.

NOTE.—It is well known that many masonry walls are thrown down or ruined during a fire by the expansion produced by heat. The requirement of this paragraph is based upon this fact.

(m). Except for window panelled backs, and permissible chases and recesses, walls shall not vary in thickness between their lateral supports. When a change in thickness, due to minimum thickness requirements, occurs between floor levels, the greater thickness shall be carried up to the higher floor level.

(n). Interior bearing-walls* that are less than twelve inches in thickness and support wooden floor or roof joists, shall be corbeled not less than three inches to

*See definition, Section 200.

receive such joists, unless approved* metal joist hangers are used.

10. **Lateral support.** The height of a masonry wall between successive floors or other substantial lateral supports shall not exceed twenty times its thickness, unless it is reinforced by adequate cross-walls, piers or buttresses at intervals not exceeding twenty times the thickness of the wall.

11. **Existing walls.** Walls heretofore* erected may be used without change, if in good condition, in buildings* hereafter* erected or altered*; provided the stresses in the masonry under the new conditions do not exceed the working stresses permitted by this ordinance.

NOTE.—For working stresses see §706-3.

12. **Parapets.**

(a). Parapets shall be provided on all fire-walls*, party-walls*, and exterior walls of masonry or reinforced-concrete*, where such walls connect with roofs other than roofs of fireproof-construction*; provided that a parapet shall not be required for a wall facing on a street* having a width of fifty feet or more, nor on a wall of a building* the roof of which is ten feet lower than the roof of a building* adjoining or adjacent to such wall, nor on the walls of a detached dwelling*, nor on the walls of a building* which is fifty feet or more distant in all directions from other buildings*.

(b). In dwellings* and in buildings* in which eight-inch walls are permitted, such parapets shall be not less than eight inches thick and carried at least two feet above the roof.

(c). In all other buildings* such parapets shall be not less than twelve inches thick, and carried not less than three feet above the roof.

(d). Parapets shall be properly coped with incombustible, weatherproof material.

*See definition, Section 200.

13. Chases and recesses.

(a). No chase shall extend into a wall more than one-third of its thickness; but no chase shall be cut or built in an eight-inch wall or within the required* area of a pier.

(b). No horizontal chase shall exceed four feet in length, nor shall the horizontal projection of any diagonal chase exceed four feet.

(c). Chases shall not be cut in hollow walls of brick or walls of hollow-block* or solid-block* masonry, but, when permitted, shall be built in.

(d). Chases shall be filled in solidly with incombustible material within the floor thickness at each floor level.

(e). Recesses for stairways* or elevators* may be left in walls of buildings*, but the thickness of the wall at such recess shall be not less than the required* thickness of the wall at the fourth story* above grade*, unless reinforced by additional piers, by steel or reinforced-concrete* girders, or by steel or reinforced-concrete* columns and girders, securely anchored to walls on each side of such recesses.

(f). The aggregate area of chases and recesses in a wall shall not exceed one-fourth of the whole area of the face of the wall in any story*.

(g). Chases or recesses that would reduce the thickness below the required* minimum, shall not be built or cut in firewalls* or fire-partitions*.

SECTION 807. REINFORCED CONCRETE.

1. General. Except as otherwise specifically provided in this ordinance or in rules duly promulgated by the building-official*, the "Building Regulations for Reinforced Concrete" as adopted and amended from time to time by the American Concrete Institute shall be deemed to be the generally accepted good practice in reinforced-concrete* construction.

*See definition, Section 200.

2. Concrete.

(a). Concrete for reinforced-concrete* shall consist of one part portland cement and not more than six parts aggregate, by volume measured dry, and not more than seven and one-half gallons of water per sack, ninety-four pounds, of cement. The aggregate shall be mixed in an approximate ratio of two parts fine aggregate and four parts coarse aggregate.

NOTE.—The provisions of this paragraph apply under ordinary conditions and do not preclude the use of other mixtures when duly authorized under §706-1b.

(b). Fine aggregate shall consist of sand, crushed stone or gravel screenings, passing when dry a screen having one-quarter-inch diameter holes, but not more than six per cent passing a sieve having one hundred meshes per lineal inch.

(c). Coarse aggregate shall consist of crushed stone or gravel or other approved* inert material which is retained on a screen having one-quarter-inch diameter holes, and graded in size from small to large particles. The maximum size shall be such that all the aggregate will pass through a one and one-quarter-inch diameter ring.

3. Reinforcement.

(a). The steel reinforcement shall conform to accepted standards.

NOTE.—Accepted standards for steel reinforcement are contained in the standard specifications for billet steel reinforcement and rail steel reinforcement of the American Society for Testing Materials. See Appendix E.

(b). Nothing herein contained shall prevent the use of steel wire or fabric for the reinforcement of slabs, for lateral reinforcement of columns, or for resistance to shrinkage and temperature stresses.

NOTE.—For acceptable wire or fabric reinforcement see the standard specification for cold drawn steel wire reinforcement of the American Society for Testing Materials. See Appendix E.

*See definition, Section 200.

4. **Design.** Buildings* and structures* hereafter* erected of reinforced-concrete* shall be designed according to generally accepted practice.

NOTE.—For generally accepted practice the “Report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete”, published by the American Society for Testing Materials and the “Handbook of Reinforced Concrete Building Design” of the American Concrete Institute may be consulted.

5. **Walls.**

(a). Enclosure walls of reinforced-concrete* shall be securely anchored at all floors. Such walls when supported by girders at each story* shall be bonded or otherwise securely tied to columns or piers.

(b). In buildings* of fireproof-construction* the thickness of walls of reinforced-concrete* shall be not less than six inches for the uppermost fifteen feet of their height*, and shall increase one inch in thickness for each successive twenty-five feet or fraction thereof measured downward from the top of the wall; provided that for walls supported by girders at each story the thickness may be, but shall not be less than, five inches; and provided that in no case shall the thickness of any part of a wall of reinforced-concrete* be less than one twenty-fifth of the unsupported height between successive floors, unless the walls are laterally supported by cross-walls, piers or built-in columns at intervals not exceeding twenty-five times the thickness of the wall.

(c). In buildings* of other than fireproof-construction*, the thickness of walls of reinforced-concrete* shall be not less than one and one-half times the thickness required* for buildings* of fireproof-construction*.

(d). The steel reinforcement, in both vertical and horizontal directions, shall be not less than one-quarter of one per cent. In walls eight inches or more in thickness the reinforcement shall be divided, and equal amounts placed near each face of the wall. Nothing smaller than the equivalent of a three-eighths-inch-

*See definition, Section 200.

round rod shall be used for reinforcement and the spacing shall not exceed eighteen inches in either direction.

6. Protection of reinforcement.

(a). The reinforcement in footings shall be covered on all sides by not less than three inches of concrete wherever such footings come in contact with the ground; and by not less than two inches of concrete where the nearest surfaces of the concrete are not in contact with the ground.

(b). The reinforcement in columns, girders and beams shall be covered on all sides by not less than one and one-half inches of concrete; in walls and floor slabs by not less than one inch of concrete; provided that when a highly siliceous aggregate or other aggregate liable to disruptive action under high temperatures is used, the concrete covering the reinforcement shall be at least one-half inch thicker than herein specified and shall be reinforced with three-inch metal mesh or finer placed one inch from the finished surface.

(c). When the exterior surfaces of the concrete are covered with cement-mortar* or gypsum-mortar* three-fourths of an inch or more in thickness, the concrete covering the reinforcement, except in footings, may be one-half inch less in thickness than herein otherwise required; provided that in no case shall it be less than three-fourths of an inch.

7. Protection against frost.

(a). Unless approved* effective provision is made against freezing, no concrete shall be deposited when the air temperature is thirty-two degrees Fahrenheit or lower.

(b). Freshly deposited concrete shall be adequately protected against freezing so long as the air temperature is thirty-two degrees Fahrenheit or lower.

(c). The provisions of this subdivision shall also apply to plain concrete and other materials liable to injury or deterioration by freezing, which are used in

*See definition, Section 200.

Sections 807—808

fireproof-construction* and semifireproof-construction* or for other required* protection against fire.

8. **Removal of forms.** Forms for reinforced-concrete* shall remain in place until the concrete has hardened. Removable floor forms, beam and girder sides, column casings and other vertical parts of forms, shall not be removed until the concrete has set sufficiently that it will not be injured by their removal. Those parts of the forms and shoring that support structural members shall not be removed until such members have acquired sufficient strength to support safely their own weight and such loads as may come upon them.

SECTION 808. STEEL AND IRON.

1. **General.** Except as otherwise specifically provided in this ordinance or in rules duly promulgated by the building-official*, the "Standard Specification for Structural Steel for Buildings" and the "Code of Standard Practice," as adopted and amended from time to time by the American Institute of Steel Construction, shall be deemed to be the generally accepted good practice in steel construction.

2. Cast iron columns.

(a). Cast iron columns shall not have a smaller outside diameter or side than five inches.

(b). The thickness of metal shall be not less than one-twelfth the diameter or least dimension of cross-section, but not less than three-fourths of an inch.

(c). Cast iron columns not cast with one open side or back, shall have three-eighths inch holes drilled in the shaft, to permit measurement of the thickness.

3. Steel columns.

(a). No part of a steel column shall be less than one-quarter of an inch thick.

(b). In buildings* and structures* exceeding forty-five feet in height*, column connections and connections of girders or beams to columns shall be riveted.

NOTE.—This provision is not intended to preclude welding wherever local policy does not prohibit it. See §808-8.

*See definition, Section 200.

4. Column bases.

(a). Whenever necessary to properly distribute the load, iron or steel shoes or billets shall be used at the lower ends of columns.

(b). Cast iron bases or shoes shall be not less than one inch thick in any part.

(c). Cast iron bases or shoes shall be planed on top, and, when resting on steel girders, on both top and bottom.

5. Lintels, beams and girders.

(a). Cast iron lintels shall not be used for spans exceeding six feet. They shall be not less than three-quarters of an inch in thickness at any point.

(b). When rolled steel beams are used in pairs to form a girder, they shall be connected together by bolts and separators at intervals of not more than five feet. All beams twelve inches and over in depth shall have at least two bolts to each separator.

(c). The thickness of web in riveted girders shall be not less than one-one hundred and sixtieth of the distance between flanges or between stiffeners, and in no case less than one-quarter of an inch.

(d). The compression flanges of steel beams and girders shall be supported laterally if the length exceeds fifteen times the width, unless the working stresses in such flanges are reduced as prescribed in this ordinance; but the distance between lateral supports shall not exceed forty times the width of the flange.

6. Riveting.

(a). All shop work shall be riveted.

(b). All component parts of built-up columns, girders and trusses, including splices in the same, shall be riveted.

(c). Rivets shall be used for the connections of main members carrying live-loads* which produce impact and for connections subject to reversal of stresses.

*See definition, Section 200.

Section 808

7. **Bolting.** Where riveting is not required by the provisions of this section connections may be effected by bolts of mild steel.

8. **Welding.**

(a). Nothing in this ordinance shall prohibit the use of arc or gas welding in the erection of steel construction in lieu of riveting or bolting.

(b). Surfaces to be welded shall be free from loose mill scale, rust, paint or other foreign matter.

(c). Surfaces to be welded shall not be painted before they are welded. Parts that are welded in the shop, to be erected by bolts or rivets in the field, shall receive the usual painting after the shop work is completed.

(d). The edges of base metal parts, one-quarter of an inch or more in thickness, transmitting stress by means of butt welds shall be beveled, the bevel of each part being not less than thirty degrees.

(e). Steel construction which is to be welded in the field shall be temporarily supported and properly aligned by erection bolts or other efficient means before the field welding is done.

(f). Except as otherwise specifically provided in this ordinance or in rules duly promulgated by the building-official*, the "Code for Fusion Welding and Gas Cutting in Building Construction", as adopted and amended from time to time, by the American Welding Society, shall be deemed to be the generally accepted good practice in welding and gas cutting.

NOTE.—For safeguards to be used in connection with welding and gas cutting see §911. For allowable stresses on welds see §706-5f.

9. **Gas cutting.**

(a). Nothing in this ordinance shall prohibit gas cutting in steel construction; provided that gas cutting shall not be done on a member while it is under stress, and that it is not done where the milling of surfaces is required for proper workmanship

*See definition, Section 200.

(b). Gas cut edges shall be smooth and regular in contour, and when used in the preparation of base metal parts for welding, shall be thoroughly cleaned to expose only clean metal.

(c). Gas cutting of holes in a member which has not been designed therefor shall not be done.

10. Tie rods.

(a). Tie rods required by this ordinance shall be not less than three-fourths of an inch in diameter.

NOTE—§1002-4i and §1003-3d.

(b). Holes for tie rods in floor arches shall be placed as near the thrust of the arch as practicable.

(c). The distance between tie rods in floors or roofs shall not exceed eight times the depth of the beams nor eight feet in any case.

11. Templates. Lintels, steel joists, beams, girders or trusses, supported at either end by a wall or pier, shall be properly anchored thereto and shall rest upon templates or shoes of cast iron, steel or stone of such design and dimensions to distribute safely the loads on the masonry, unless the bearing surface of the lintels, steel joists or beams is sufficient to distribute the load.

12. Protection against corrosion.

(a). Unless completely covered with cement grout or mortar or completely imbedded in concrete, structural steel shall have at least one coat of paint before erection, and after erection at least one additional coat of a different shade than the first

(b). Cast iron columns shall not be painted until after inspection.

(c). All scale, dirt and rust shall be completely removed before painting iron or steel.

(d). Iron or steel used under ground or under water shall be encased in concrete.

NOTE.—Compare §802-2a.

13. Protection against fire. In buildings* or structures* of ordinary-construction* or heavy-timber-con-

*See definition, Section 200.

struction*, iron or steel hereafter* placed to support a masonry wall or part thereof, or a street* surface, if not protected as required* for fireproof-construction*, shall be protected with not less than two inches of fireproofing materials applied in a manner to afford a fire-resistance rating of not less than three hours; provided that such protection shall not be required for lintels supporting walls over openings eight feet or less in width.

NOTE.—It will be noted that the provisions of this subdivision apply to ordinary and heavy timber construction. They must not be taken to modify the requirements for the fireproofing of steel in fireproof or semifireproof construction. See §1002-4 and §1003-2.

For acceptable forms of construction see §1003-2.

SECTION 809. WOOD CONSTRUCTION.

1. Beams and joists.

(a). In buildings*, other than buildings* of frame-construction*, wooden beams and joists, except headers and tail joists, shall have bearings of at least four inches.

(b). The ends of wooden beams and joists resting on masonry walls, shall be cut to a bevel of three inches in their depth.

(c). Wooden trimmers, headers and tail joists over six feet in length, unless supported on walls or girders, shall be hung in approved* metal stirrups or hangers.

(d). No wooden beam or joist shall be cut or pierced in any manner that would cause it to be of insufficient strength for its load.

(e). Except in the case of pitched roofs, wooden floor and roof joists having spans in excess of eight feet shall be rigidly braced with continuous rows of bridging at intervals not exceeding eight feet.

(f). Except in buildings* of frame-construction* or of ordinary-construction*, wooden beams and joists shall not be dependent for their support on wooden stud

*See definition, Section 200.

partitions nor on walls or partitions constructed of combustible materials. Nothing in this section shall prohibit the use of wooden girders and wooden posts for the support of beams or joists, even though the spaces between posts may be filled with partitions of any material.

(g). In ordinary-construction* all trimmers and at least one beam or joist in every six feet, which rest on masonry walls, shall be secured to such walls by approved* metal anchors attached in a manner to be self-releasing. When one end of such a trimmer, beam or joist is supported by a girder, it shall be secured in an approved* manner to such girder or to a trimmer, beam or joist correspondingly supported from the opposite side of such girder. Trimmers, beams or joists supported by girders at both ends shall be similarly secured to such girder or to trimmers, beams or joists supported from opposite sides on such girder, to form continuous ties between opposite masonry walls.

(h). Where floor or roof joists, or beams run parallel to masonry walls or alongside of piers otherwise unsupported, such walls and piers shall be secured to four or more joists of the floor or roof construction by approved* metal anchors.

(i). In ordinary-construction* wall-plates and roof construction shall be anchored to the walls at least every six feet. In heavy-timber-construction* every roof girder, and every alternate roof beam, shall be anchored to an exterior or interior wall or to an interior column; roof planking where supported by a wall shall be anchored to such wall at intervals not exceeding twenty feet; every monitor and every saw-tooth construction shall be anchored to the main roof construction. Such anchors shall consist of steel or iron bolts or straps of sufficient strength and ample anchorage to resist a vertical uplift of the roof of not less than twenty pounds per square foot of roof surface.

*See definition, Section 200.

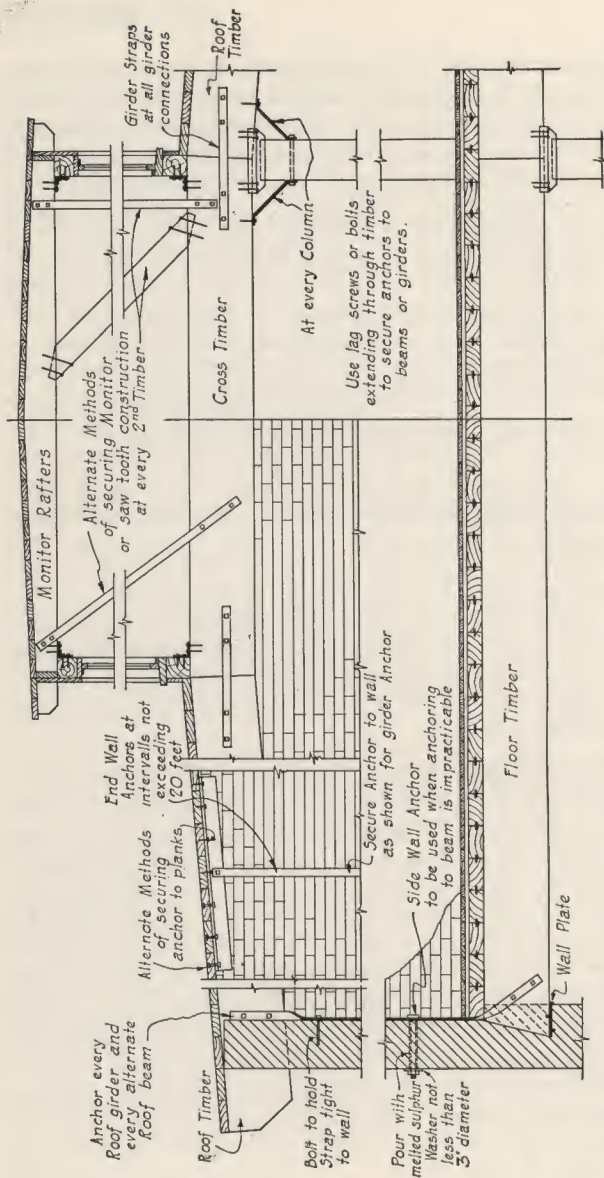


Fig. 4.
Suggested methods of anchoring roofs in heavy timber construction, §809-1i. For the anchors nothing less than three-eighths inch stock should be used. A suitable size for the flat anchors against the walls would be three-eighths by two inches.

2. Girders.

(a). Wooden girders shall be anchored to the walls and fastened to each other with suitable steel straps.

(b). When a wooden girder rests on masonry an air space of one-half inch shall be provided on the sides and end of such girder for ventilation.

3. Wooden posts.

(a). Wooden posts in the several stories* of a building*, shall be set directly above one another.

(b). The loads on wooden posts shall be transmitted to the posts below through reinforced-concrete* or metal caps with brackets, or through metal caps and bases with pintle connections or other approved* column connections; provided that wooden bolsters may be used to support roof girders.

NOTE.—See also §1004-2b.

(c). Wooden posts shall not rest directly on floor joists.

(d). When supported by masonry, suitable stone or metal bases shall be set between the post and the masonry.

(e). Wooden posts when used in the lowest story* shall rest on masonry or metal footings extending not less than six inches above the floor level.

NOTE.—In districts subject to termite troubles, additional provisions for protection against destruction should be included as suggested in Appendix M.

4. Bolting. All bolts in wood-construction shall be provided with washers of such proportions that the compression on the wood at the face of the washer will not exceed the working stresses prescribed in this ordinance.

5. Fire prevention.

(a). Wooden joists, beams and girders resting on opposite sides of a masonry wall shall be separated from

*See definition, Section 200.

one another by at least six inches of solid masonry, except as otherwise prescribed for heavy-timber-construction*.

NOTE.—Staggering the beams distinctly lessens the danger of transmission of fire through a wall, for the reason that the fire or highly heated air must travel through two joints at right angles to each other to pass from one beam to the other. The probability of both joints being open is much less than in the case of one straight connecting joint.

Re heavy timber construction see §1004-3f.

(b). All wooden beams and joists shall be trimmed away from flues and chimneys. Headers, beams and joists running parallel to the wall shall be not less than two inches from the outside face of a chimney or from masonry enclosing a flue. Headers supporting trimmer arches at fireplaces shall be not less than twenty inches

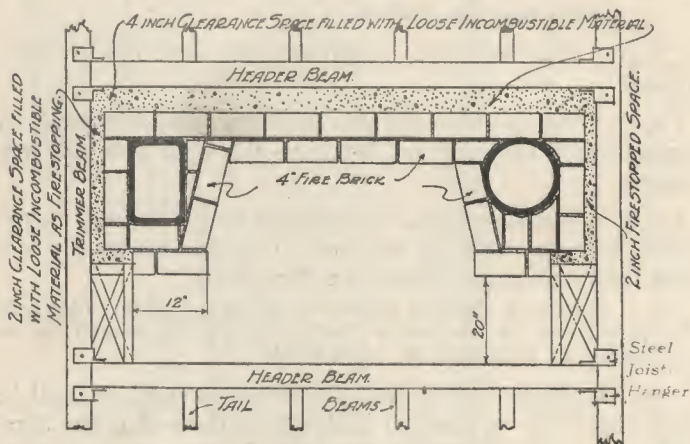


FIG. 5.

Floor framing around a fireplace, §809-5b.

*See definition, Section 200.

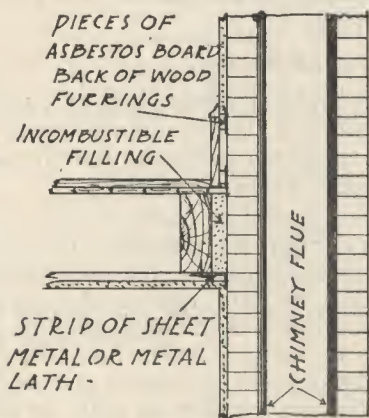
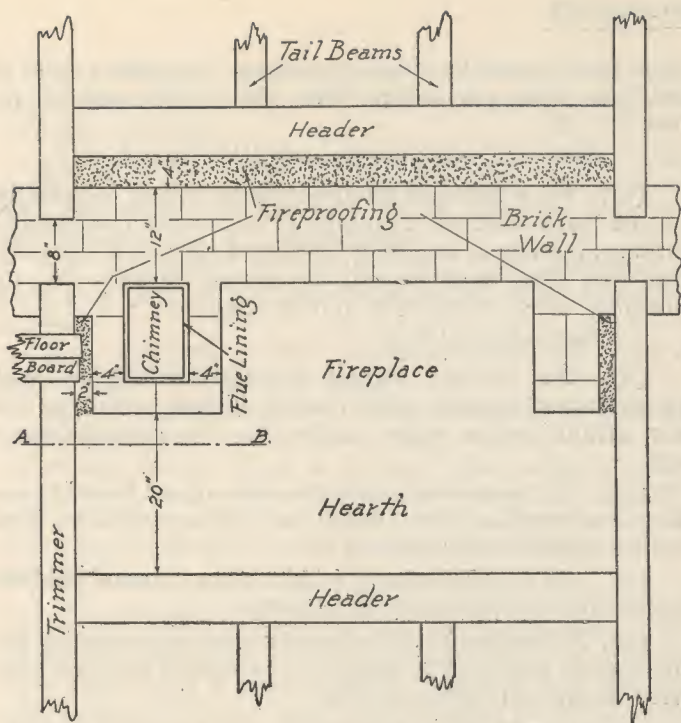


FIG. 6.

Firestopping around chimney and fireplace, §809-5a.

Section 809

from the face of the chimney breast. Trimmers shall be not less than six inches from the inside face of the nearest flue.

NOTE.—Re trimmer arches see §1100-11b and c.

(c). No woodwork shall be placed within four inches of the back face of a fireplace; nor shall combustible lathing, furring or studding be placed against a chimney; but this shall not prevent plastering directly on the masonry or on metal lath and furring.

NOTE.—See §1100-1g.

(d). No wooden mantel or other woodwork shall be hereafter* placed within eight inches of either side nor within twelve inches of the top of a fireplace opening.

(e). All spaces between the masonry of chimneys or flues and wooden joists, beams or headers shall be filled with incombustible material.

(f). All spaces back of combustible mantels shall be filled with incombustible materials.

(g). All spaces between combustible wainscoting and the wall or partition to which it is attached shall be filled with incombustible materials.

NOTE.—Additional requirements are prescribed in §1007 on fire-stopping.

6. Frame construction.

(a). Walls and partitions shall be constructed to develop a strength and rigidity equivalent to wooden studding, not less than two inches by four inches, spaced not to exceed sixteen inches on centers.

(b). Where exterior walls or parts thereof more than one story high are sheathed the boards shall be not less than three-fourths inch actual thickness. Sheathing boards shall be laid tight and properly nailed to each stud with not less than two eightpenny nails. Where the sheathing is omitted or is not laid diagonally, all corners shall be diagonally braced and such other measures taken to secure rigidity as may be necessary.

*See definition, Section 200.

(c). Wooden sheathing may be omitted when other approved* types of construction of adequate strength and stability are used.

(d). Ledger or ribbon boards used to support joists shall be not less than one by four inches, shall be cut into the studs, and securely nailed with not less than two tenpenny nails to each stud.

(e). Sills shall be not less than four inches by six inches secured to the foundation-walls* in an approved* manner.

(f). No part of the wooden frame-work shall be placed below the ground level.

(g). In buildings* of frame-construction*, except private-garages*, an exposed wall which is less than three feet distant from a lot-line* other than a street-line*, shall have a fire-resistance rating of not less than two hours; provided that the material of the weather surface may be similar to that of the other exterior walls of the building*.

(h). In buildings* of frame-construction*, an exposed wall which is less than ten feet distant from a wall of another building* of frame-construction* on the same lot*, shall have a fire-resistance rating of not less than two hours; provided that the material of the weather surface may be similar to that of the other exterior walls of the building*; and provided that when the aggregate area* of the two buildings* does not exceed one and one-half times the limiting area fixed by this ordinance for either building*, such fire-resistance rating shall not be required.

(i). Walls or partitions separating two or more dwellings* of frame-construction* shall consist of wooden studs covered on both sides with gypsum-mortar* or cement-mortar*, not less than three-fourths of an inch in thickness, on expanded metal lath, or of some other construction having a fire-resistance rating of not less than one hour.

7. Stucco.

(a). Stucco shall consist of cement-mortar* or other approved* mortar, on wooden lath, or on metal

*See definition, Section 200.

Section 809—810

lath weighing not less than three pounds per square yard, or on woven or welded wire lath not lighter than No. 19 gage.

(b). If sheathing for frame-construction* is omitted, the stucco shall be back-plastered.

(c). Stucco shall be kept at least eight inches above adjacent ground surfaces.

(d). Non-corrodible flashing, to prevent moisture from penetrating behind the stucco, shall be provided at wall openings.

SECTION 810. MISCELLANEOUS REQUIREMENTS.

1. Vaults and areas.

(a). The walls of vaults and areas* and the roofs of vaults shall be constructed of approved-masonry*, reinforced-concrete* or steel beams with masonry arches.

NOTE.—Re construction of vaults in connection with blower or exhaust systems see §1204-6.

(b). Openings in the roofs of vaults under street* surfaces shall be provided with substantial covers of incombustible materials, flush with the top surface and constructed to prevent persons from slipping thereon. Covers shall be maintained normally closed, and when open for use shall be fully guarded to prevent accidents.

NOTE.—Limitations on the use of vaults and areas under street surfaces are given in §405-4k and l.

(c). Glass used in vault lights shall not exceed sixteen square inches for one light.

2. Floor lights.

(a). Floor lights in floors within a building* shall have metal or reinforced-concrete* frames, and shall have the same strength as the floors in which they are placed.

(b). The glass in floor lights shall be not less than three-fourths of an inch in thickness.

(c). If lights exceed sixteen square inches in area, wired glass shall be used or a metal screen shall be placed under the floor light.

*See definition, Section 200.

3. Bay windows and show windows. Bay windows and show windows that extend beyond exterior walls, hereafter* constructed on buildings* other than buildings* of frame-construction* shall be constructed of incombustible materials; provided that show windows that do not extend above the second story* floor level on buildings* of ordinary-construction* and bay windows on dwellings* of ordinary-construction* may be constructed of wood covered on the exterior surfaces with metal or other approved* incombustible, weatherproof materials; provided further that when bay windows on dwellings* of ordinary-construction* are not more than ten feet in width, such covering on the exterior surfaces shall not be required.

NOTE.—The projection of bay windows or show windows beyond the street line is not permitted under the provisions of this code. See §405.

4. Non-bearing partition construction.

(a). The unsupported height of non-bearing partitions shall not exceed thirty-six times the thickness of the partition exclusive of plastering; provided that when steel reinforcement is embedded within the thickness of the partition inclusive of plastering but not more than one inch distant from both faces, the unsupported height may be but shall not exceed sixty times the thickness exclusive of plastering.

(b). All non-bearing partitions shall be built solidly against floor and ceiling construction, and when reinforced for the purpose of the greater ratio of height to thickness over unreinforced partitions, shall have such reinforcement securely anchored to floor and ceiling construction in an approved* manner.

5. Partitions in multifamily houses. In every building* hereafter* erected or altered* to be occupied* as a multifamily-house* partitions separating apartments*, or apartments* from hallways, or apartments* from other occupancies, and partitions separating stores, or stores from hallways or other occupancies, unless constructed of approved-masonry*, shall, in buildings* of fireproof-con-

*See definition, Section 200.

Section 810

struction*, be fire-partitions*, and, in buildings* of semi-fireproof-construction* or heavy-timber-construction*, shall be partitions having a fire-resistance rating of not less than two hours, with openings, in either case, equipped with approved* fire doors; provided that in buildings* of frame-construction* and ordinary-construction* such partitions may consist of wooden studs covered on both sides with gypsum-mortar* or cement-mortar* not less than three-fourths of an inch in thickness, on expanded metal lath or of some other construction having a fire-resistance rating of not less than one hour.

NOTE.—For acceptable forms of fire partitions see §1006; of construction affording a one hour rating see §1003-4.

6. Cellar partitions. Except in dwellings* and buildings* of frame-construction*, partitions hereafter* erected in cellars* shall be constructed of incombustible materials or shall have a fire-resistance rating of not less than one hour, unless such partitions enclose only coal or wood bins and do not extend to the ceiling, unless such cellars are sprinklered*.

NOTE.—For acceptable forms of construction see §1003-4.

7. Ceilings in multifamily houses. In every building* hereafter* erected or altered* to be occupied* as a multifamily-house*, the floor construction immediately above those parts of the building* occupied* for business purposes shall have a fire-resistance rating of not less than one hour, unless such parts are sprinklered*.

NOTE.—The following construction has developed a fire resistance rating of one hour in the standard fire test: wooden joists, bridged and firestopped, with double board flooring, having insulating material between the two layers of boards, and a ceiling of three-coat fibred or sanded gypsum mortar not less than three-fourths of an inch thick on expanded metal lath not lighter than 25 U. S. gage.

8. Cellar ceilings. In buildings* of ordinary-construction* or frame-construction*, except dwellings* and one-story buildings* outside of the fire-limits*, hereafter* erected or altered* to change their occupancy

*See definition, Section 200.

classification, the ceilings over cellars* shall be gypsum-mortar* or cement-mortar* not less than three-fourths of an inch in thickness on expanded metal lath, or the floors above such cellars shall have a fire-resistance rating of not less than one hour, unless such cellars are sprinklered*.

NOTE.—For an acceptable floor construction having a one-hour rating see note under preceding subdivision.

9. Concrete floor. Every floor resting directly on the ground below curb-level* shall be constructed of portland cement concrete*, not less than three inches thick laid on not less than four inches of sand or cinders, or constructed in some other approved* manner to guard against dampness from below such floor.

10. Drainage. In buildings* of fireproof-construction* or semifireproof-construction* occupied* as factories or storage warehouses, and in buildings* of heavy-timber-construction*, hereafter* erected, provision shall be made for the discharge of water from every floor and for adequate drainage from courts or other spaces receiving such discharge.

NOTE.—The discharge of water required by this subdivision may be through approved scuppers in the outside walls of the building, by means of interior floor drains or by sloping floors to elevator or stair shaftways.

11. Waterproofing. In buildings* hereafter* erected, if by reason of dampness in the ground, the building-official* shall deem it necessary to do so, the outside surfaces of foundation-walls* below the adjacent ground level shall be covered with waterproofed portland cement or otherwise rendered waterproof by some approved* process.

12. Repairs. Every building* and structure* heretofore* or hereafter* erected shall be kept in good repair to maintain the conditions of safety and habitability prescribed by this ordinance; and rain water shall be so drained and conveyed therefrom to prevent dampness in the walls and ceilings.

*See definition, Section 200.

ARTICLE IX

SAFEGUARDS DURING CONSTRUCTION

SECTION 900. GENERAL.

The provisions of this article shall apply to all work in connection with the erection, alteration*, repair*, removal or demolition of buildings* or structures*.

NOTE.—“A Safety Code for Workers in the Construction Industry” prepared under the supervision of a committee of the American Institute of Architects and issued by the Labor Research Association, New York City, and “A Manual of Accident Prevention in Construction” issued by the Associated General Contractors of America, Washington, D. C., contain information and suggestions worth consideration in this connection.

SECTION 901. SCAFFOLDS.

1. **Construction.** All scaffolds shall be safely constructed and firmly supported, properly secured and of sufficient width, to insure the safety of persons working thereon, or passing under or near them.

2. **Guard rails and toe boards.**

(a). Every scaffold, other than iron workers' scaffolds and carpenters' bracket scaffolds, the platform level of which is more than six feet above the ground or above a permanent or temporary floor, shall be provided with guard rails not less than thirty-six inches high above the platform level, and with solid toe boards not less than six inches high above the platform level, extending its entire length and along the ends, except where ramps or runways connect with them, unless otherwise enclosed or guarded.

(b). On suspended, swinging and pole scaffolds the space between guard rails and toe boards shall be filled with wire mesh screens securely attached.

3. **Overhead protection.** When objects are likely to

*See definition, Section 200.

fall on a scaffold from above a substantial overhead protection shall be provided not more than ten feet above the scaffold platform.

4. **Planking.** Planks used for the platforms of scaffolds shall be not less than one and five-eighths inches thick, of sound, seasoned lumber. The clear span between supports shall not exceed ten feet.

SECTION 902. SIDEWALK SHEDS.

1. **When required.** Whenever a building* or structure* within ten feet of a street-line*, is to be erected or raised to exceed forty feet in height*, or whenever such a building* or structure* more than forty feet in height* is to be demolished, the owner* or the person* doing or causing such work to be done shall erect and maintain during such work in front of said building* and adjacent to the street-line* a shed of sufficient strength and stability to sustain safely the weight of materials that may be placed thereon and to withstand the shocks incident to the handling of such materials or their preparation for use and accidental jars from trucks passing or delivering material.

2. **Railings and toe boards.** When the roof of such shed is used for the storage of material or for the performance of work of any kind, substantial railings not less than three feet high and solid toe boards not less than six inches high shall be placed along the open sides and ends of such roof.

3. **Walkway.** Such shed shall be constructed to afford an unobstructed walkway for pedestrians, not less than eight feet high and five feet wide.

4. **Maintenance.** Such shed shall remain in place until the building is enclosed, or, in case of a demolition, until the building has been reduced to twenty feet in height*.

*See definition, Section 200.

SECTION 903. TEMPORARY FENCE.

In a building operation that does not require a sidewalk shed, the owner* or person* doing or causing such work to be done, shall, unless released by the building-official*, erect and maintain in front of the building* or structure* during such building operation, a substantial fence not less than eight feet high. Such fence may extend not more than six feet from the street-line* into the highway, and shall be built solid for its full length except for such openings, provided with sliding doors or doors swinging inwards, as may be necessary for a proper prosecution of the work.

SECTION 904. HOISTS.

1. Interior hoists.

(a). Temporary construction hoists on the interior of buildings* or structures* shall have the car substantially constructed, the guides rigidly secured and overhead machinery safely supported.

(b). The floor openings or other spaces through which they operate shall be enclosed on all sides and for their full height, except for the necessary doors for loading and unloading with barriers so constructed that heads, arms or legs cannot be thrust through them or loose material cannot fall through.

2. Exterior hoists.

Temporary construction hoists on the exterior of buildings* or structures* shall be erected on sufficiently solid foundations to avoid injurious settlement or distortion.

3. Elevators.

(a). When a building* exceeding sixty feet in height* is to be equipped with one or more elevators*, at least one of such elevators* shall be installed, in a fireproof shaft*, as soon as construction conditions permit.

(b). Such elevator* shall be maintained in operative

*See definition, Section 200.

condition and ready for service at all times, in charge of a competent operator.

NOTE.—See also §1409.

(c). No elevator* or hoist shall be used for the transportation of persons during construction operations, unless it is equipped for passenger service in conformance with law or ordinance.

NOTE.—For further requirements, see §1400, §1402 and §1403.

4. Hoisting machinery.

(a). Hoisting machinery, including boilers, if any, shall be placed to avoid unnecessary hazards and to provide ample room for the free and safe movement of operation.

(b). Such machinery shall be enclosed to exclude unauthorized persons. If placed outside the building further protection against falling objects and inclement weather shall be provided.

(c). When such hoisting machinery is placed within a building* or structure*, or within ten feet of any part thereof, only incombustible materials shall be used for the exterior covering of the enclosures.

(d). If hoisting machinery is operated by steam with boiler on or adjacent to premises, suitable spark guards shall be provided for smoke stack.

SECTION 905. TEMPORARY FLOORING.

1. Working floor. In buildings* or structures* of skeleton construction, the entire tier of beams on which construction of the frame is proceeding, known as the working floor, shall be thoroughly planked over, except spaces required for construction work, for raising or lowering materials and for stairways or ladders.

2. Permanent floors. In buildings* or structures* of skeleton construction the permanent floor construction, except for necessary temporary openings, shall be installed as the construction progresses. There shall be not

*See definition, Section 200.

more than three unfilled floors above the highest permanent floor, nor more than one unfilled floor below that between permanent floors.

3. **Wood construction.** In buildings* of ordinary-construction* or heavy-timber-construction* the under flooring shall be laid for each story as the building progresses, or if double floors are not to be used, the floor two stories below the one where work is under way shall be planked over.

SECTION 906. FLOOR OPENINGS. All floor openings, unless guarded by permanent enclosures or full-height temporary barriers, shall be covered with substantial temporary flooring, or guarded on all sides by substantial railings not less than three feet high set at least two feet from the edges of the openings, and by toe boards not less than six inches high set along the edges of the openings, except for such parts of the openings as are necessarily open for traffic purposes.

SECTION 907. ROOFS AND SKYLIGHTS OF ADJOINING BUILDINGS. When a building* or structure* is to be carried above the roof of an adjoining building*, protection for the skylights and roof of such adjoining building* shall be provided, at his own expense, by the person* constructing or causing the construction of such building* or structure*; provided that if the owner*, lessee or tenant of the adjoining building* should refuse permission to have the roofs and skylights protected, the responsibility and expense for the necessary protection shall devolve on the person* refusing this permission.

SECTION 908. STAIR FACILITIES.

1. **Temporary stairs.** When the construction of a building* has progressed to a height exceeding sixty feet above grade* or when a building* exceeding sixty feet in height* is undergoing alterations* or repairs*, unless one or more permanent stairways* have been installed,

*See definition, Section 200.

at least one temporary stairway* shall be provided, continued in height as rapidly as the work progresses to the highest floor that has been installed, and maintained in serviceable condition until a permanent stairway* has been completed.

NOTE.—Stairways to be safe must have the treads and risers so proportioned that travel on them is easy without causing unusual muscular actions. For proper proportioning, see §604-6 and 7.

2. Ladders. Until either permanent or temporary stairways are installed, suitable substantial ladders securely fastened at top and bottom, shall be provided and maintained to provide means of reaching the various levels.

NOTE.—For details of ladder construction see the "Safety Code for the Construction, Care and Use of Ladders" printed as Bulletin No. 351, U. S. Bureau of Labor Statistics.

SECTION 909. FIRE PROTECTION.

1. Steel frame construction.

(a). In every building* of steel frame construction, the columns in all stories* below and above grade*, to a point at least thirty feet above grade*, shall be fire-proofed as required by this ordinance before any part of the construction is erected or maintained in excess of sixty feet above grade*.

(b). No part of the building* shall be used for the storage of combustible material until such fireproofing of that part has been installed.

2. Reinforced concrete construction.

(a). In every building* of reinforced-concrete* construction, forms of combustible material shall be removed as soon as conditions will permit.

(b). No part of such building* shall be used for the storage of combustible materials until such forms have been removed in that part of the building*.

3. Standpipes. In all buildings in which standpipes are required by law or ordinance, such standpipes shall

*See definition, Section 200.

Section 909

be installed as the construction progresses, in such a manner that they are always ready for fire department use to the topmost floor construction that has been installed. Such standpipes shall be provided with a fire department connection on the outside of the building at the street level, and with one outlet at each floor. All outlets, connections and fittings shall be designed to fit the fire department equipment.

NOTE.—Re standpipes see §1701.

4. Fire extinguishers.

(a). In every building operation wherever a tool house, storeroom or other shanty is placed, or a room or space is used for storage, dressing room or workshop, at least one approved* hand pump tank or portable chemical extinguisher of non-freezing type or protected against freezing shall be provided and maintained in an accessible location.

NOTE.—For acceptable extinguishers see "List of Inspected Fire Protection Appliances" issued by Underwriters Laboratories, Inc.

(b). When a water supply of not less than one hundred gallons per minute at twenty-five pounds nozzle pressure, ready for use at all times, is installed as the building operation progresses, a small hose, fifty feet in length, with a one-half inch nozzle, may be substituted for each such fire extinguisher.

5. Access to fire extinguishing equipment. During building operations, free access from the street* to fire hydrants, and to outside connections for standpipes, sprinklers or other fire extinguishing equipments, whether permanent or temporary, shall be provided and maintained at all times. No material or construction equipment shall be placed within five feet of such hydrant or connection, nor between it and the center line of the street*.

NOTE.—Re standpipes see §1701; re sprinkler equipments see §1702.

*See definition, Section 200.

SECTION 910. HEATING.

1. **Permanent heat.** The permanent heating equipment shall be installed and put in operation as soon as practicable.

2. Temporary heat.

(a). When salamanders or other temporary heating devices are used, if a temporary heating plant is impracticable and until a permanent heating plant is installed, they shall not be set on combustible flooring or platforms unless thoroughly insulated therefrom by a bed of sand or cold ashes not less than four inches thick, or by other efficient protection, extending at least two feet horizontally beyond such devices on all sides. The legs of such devices shall rest on the insulation and shall not extend through it.

(b). Such devices shall be so located that there is a clearance of not less than six feet above nor less than two feet six inches on all sides, between such device and unprotected woodwork or combustible material, equipment or construction. Nor shall such devices be placed within ten feet in any direction of tarpaulins or canvas covers.

(c). Salamanders and similar heating devices shall be of a substantial type with protective screen covers, and shall be under constant attendance of a competent man on each floor, so long as they are in use.

SECTION 911. WELDING AND CUTTING.

1. **Protective shield.** When gas welding or cutting is done above or within ten feet of combustible material, or above a place where workers are employed or where persons are likely to pass, incombustible shields shall be interposed to protect such materials and persons against sparks, and hot metal or oxide.

2. Gas and fuel tanks.

(a). Tanks of fuel gas shall not be moved or allowed to stand for any extended period when not in actual use, unless the caps of such tanks are in place.

Sections 911—912—913

(b). Suitable cradles shall be used for lifting or lowering oxygen or fuel tanks, to reduce to a minimum the possibility of dropping tanks. Ordinary rope slings shall not be used.

(c). Tanks supplying gases for gas welding or cutting shall be located at no greater distance from the work than is necessary for safety. Such tanks shall be securely fastened in place, and, unless unavoidable, in an upright position.

(d). Tanks supplying gases for gas welding or cutting shall be so stored or set in place for use that they are not exposed to the rays of the sun or to high temperatures. Combustible material shall not be permitted near such tanks.

3. Cutting steel. Before steel beams or other structural shapes or elements of construction are cut by means of a gas flame, they shall be secured by ropes or chains to prevent dropping or swinging.

SECTION 912. WATCHMAN.

1. When required. When deemed necessary by the building-official*, a competent watchman shall be kept on duty at all times when no work of construction, alteration* or repair* is actually going on.

2. Periodic inspection. A thorough inspection of the entire building shall be made at the close of each day's work by someone designated and instructed for that purpose who shall report conditions to the watchman on duty.

SECTION 913. STORAGE OF MATERIAL.

1. Within building. Materials or equipment needed in a building operation, if stored within the building*, shall be so placed that they will not load any part of the construction in excess of the weights for which it was designed, nor interfere with the safe prosecution of the work.

*See definition, Section 200.

2. Outside building.

(a). Materials and equipment shall not be stored in a street* except by special permission of the building-official* and under such conditions as he may impose.

(b). In whatever manner building material may be stored or equipment set up in a street*, a safe walkway not less than four feet wide, unobstructed for its full length and adequately lighted at all times shall be maintained for use of the public.

3. Covering material. Materials stored within the building* or within ten feet of the building* which require covering shall be protected by incombustible material.

SECTION 914. DISPOSAL OF WASTE.

Waste material and rubbish shall not be stored nor allowed to accumulate within the building* or in the immediate vicinity, but shall be removed from the premises as rapidly as practicable. Combustible waste and rubbish shall be removed at least daily. No material shall be disposed of by burning on the premises or in the immediate vicinity. Dry material or rubbish shall be wetted down, if necessary, to lay dust or prevent being blown about.

SECTION 915. WARNING LIGHTS.

All pits, excavations, fences, barriers, builder's equipment, building materials or rubbish in or upon a street* shall have placed upon or by them, after dark, illuminated lamps with red globes, in such manner that there shall be one light at each end, and at intermediate points as may be necessary to afford proper warning.

SECTION 916. CELLAR DRAINAGE.

Before the foundation-walls* of a building* or structure* are completed, provision shall be made to prevent water accumulating in the excavation or cellar.

*See definition, Section 200.

SECTION 917. LIGHTING.

All parts of buildings* or structures* under construction and all sheds, scaffolds and other equipment in connection therewith, where work is being performed or persons must necessarily pass, shall be adequately lighted to insure safety.

SECTION 918. SANITATION.

1. **Toilets.** Until permanent provision is made, suitable and adequate temporary toilet facilities shall be provided during the erection, alteration* or repair* of a building*.

2. **Water.** An adequate supply of pure, cool drinking water shall be provided for workers during hours of employment.

SECTION 919. PERSONAL INJURY.

1. **First aid.** On every building operation, a supply of iodine or mercurochrome and aseptic gauze bandages shall be provided and maintained in a clean, sanitary cabinet, at all times available.

NOTE.—On large building operations it is desirable to install a first-aid room or field hospital. Suggestions for the kind of supplies that should be kept on hand may be found in "A Safety Code for Workers in the Construction Industry", issued by the Labor Research Association, New York City.

2. **Medical attention.** Arrangements shall be made for prompt medical attention in case of need.

NOTE.—Telephone numbers of the doctors or hospital with whom arrangements have been made should be posted in conspicuous places.

SECTION 920. DEMOLITION.

1. **Procedure.** In the demolition of buildings*, other than buildings of frame-construction*, one story* at a time shall be completely removed. No wall, chimney, or other construction shall be allowed to fall in mass on a floor. Bulky material, such as beams and columns, shall be lowered and not thrown.

*See definition, Section 200.

2. Chutes.

(a). Chutes for the removal of materials and debris shall be provided in all such parts of demolition operations that are more than twenty feet above the point where the removal of material is effected.

(b). Such chutes shall be completely enclosed. They shall not extend in an unbroken line for more than twenty-five feet, but shall be equipped at intervals of twenty-five feet or less with substantial stops to prevent descending material from attaining dangerous speeds.

(c). The bottom of each chute shall be equipped with a gate or stop, with suitable means for closing or regulating the flow of material.

3. **Sprinkling.** Chutes, floors, stairways and other places affected shall be sprinkled sufficiently to keep down the dust.

4. The provisions of this article in the sections entitled "Scaffolds", "Sidewalk sheds", "Temporary fence", "Hoists", "Heating", "Watchman", "Storage of material", "Disposal of waste", "Warning lights", "Lighting", "Sanitation" and "Personal injury" shall apply to demolition operations as well as building operations.

ARTICLE X

FIRE PROTECTION AND FIRE PREVENTION

SECTION 1000. DETERMINATION OF FIRE RESISTANCE.

1. Building materials and assemblies.

(a). The fire-resistance of walls, partitions, columns, girders, beams, floor-fillings* and other structural members which constitute permanent integral parts of a finished building* or structure*, when not specifically designated in this ordinance, shall be determined by performance under the standard-fire-test*.

NOTE.—The standard fire test is given in full in Appendix C.

*See definition, Section 200.

Section 1000

(b). Within the limitations and restrictions specified in this ordinance for given uses and conditions, the following materials are recognized as suitable for fire-proofing purposes:

clay or shale brick laid in cement-mortar* or cement-lime-mortar*;

concrete consisting of one part portland cement, and not more than two parts of sand and four parts of gravel, stone or other approved* aggregate;

porous or semi-porous hollow clay tile laid in cement-mortar*, cement-lime-mortar* or gypsum-mortar*;

gypsum blocks, containing not more than twelve and one-half per cent by weight of cinders, asbestos fiber, wood chips or vegetable fiber, laid in gypsum-mortar*.

Such materials shall be thoroughly bonded or secured in place by suitable metal ties or fabric.

(c). The use of other materials or assemblies of materials for fire protection purposes shall not be deemed to be prohibited when approved by the building-official* on satisfactory evidence, after fire test, of their efficiency.

(d). The provisions of this article are minimum requirements for fire protection purposes and shall not be deemed to modify the requirements of other articles of this ordinance.

2. Fire protection appliances.

(a). Except as otherwise specifically provided in this article, fire protection appliances such as fire doors, fire windows, automatic and open sprinklers and automatic-releasing devices, shall conform to the specifications in rules duly promulgated by the building-official*.

NOTE.—For procedure and conditions in the promulgation of rules see §101-5.

(b). In the absence of such specifications or when not inconsistent with the provisions of this ordinance or of duly promulgated rules, appliances enumerated in the most recent "List of Inspected Fire Protection Ap-

*See definition, Section 200.

pliances of Underwriters' Laboratories, Inc." shall be deemed to meet the requirements of this ordinance.

NOTE.—See Appendix B.

SECTION 1001. PROTECTION OF STRUCTURAL MEMBERS.

1. General.

(a). Structural members in buildings* or structures* of fireproof-construction* or semifireproof-construction* shall be so constructed, assembled and protected that they will afford the fire-resistance required to meet the hazards involved in the occupancy, in addition to and irrespective of other requirements of this ordinance; but the ultimate fire resistance shall be not less than that required* for the type of construction used, unless otherwise specifically provided.

(b). When a greater ultimate fire-resistance than the minimum fixed for fireproof-construction* is required* to meet the hazard involved in a given occupancy the building-official* may approve the use of a proposed material, assembly or mode of protection, upon the submission of satisfactory evidence that such material, assembly or mode of protection has developed in a standard-fire-test* the ultimate fire-resistance necessary to meet such hazard.

SECTION 1002. FIREPROOF CONSTRUCTION.

1. General.

(a). Any form of construction that develops in the standard-fire-test* the required* ultimate fire-resistance shall be acceptable in fireproof-construction*.

(b). The forms of construction which meet the requirements of this section shall be deemed to provide the minimum fire-resistance required* for fireproof-construction*; but their use, when a greater fire-resistance is necessary to meet the hazards involved in the occu-

*See definition, Section 200.

Section 1002

pancy, shall not be precluded if they have developed the necessary fire-resistance in the standard-fire-test*.

2. Masonry.

(a). Solid walls of clay, shale, concrete or sand-lime brick laid up in cement-mortar* or cement-lime-mortar*, and solid walls of concrete* shall be of the thicknesses prescribed in this ordinance.

NOTE.—The wall thicknesses required are prescribed in §806-9.

(b). Hollow walls of brick and walls of hollow-blocks* or solid-blocks*, except panel walls in buildings* of skeleton frame construction, shall be not less than twelve inches thick; provided that walls entirely of hollow clay tile shall have not less than three cells in the thickness of the wall.

(c). Stone masonry shall not be used in the construction of interior piers, columns, arches or vaultings that support loads in addition to their own weight; but this shall not prohibit the use of stone facing, provided such facing is not part of the required* construction.

NOTE.—The tendency of natural stones generally to spall or disintegrate under excessive heat makes them unsuitable, from the standpoint of fireproofing, for structural elements in building construction unless used in connection with some other adequate construction.

3. Reinforced concrete. Reinforced-concrete* construction shall conform with the provisions of this ordinance relating to reinforced-concrete* construction.

NOTE.—See §807.

4. Structural iron and steel.

(a). Iron and steel columns placed within exterior walls or along the outer lines of a building* shall be protected by approved-masonry* not less than four inches thick; provided that the interior faces may be protected as hereinafter specified for columns in the interior of the building*.

(b). For the protection of iron and steel columns in the interior of a building*, brickwork shall be not less than three and three-quarter inches thick; concrete shall be not less than two inches thick; hollow clay tile shall

*See definition, Section 200.

be not less than four inches thick and, when single shell tile is used, it shall be plastered on the exposed surfaces with gypsum-mortar* or cement-mortar* at least one-half inch in thickness, or when double shell tile is used it may be unplastered; poured gypsum or solid gypsum block shall be not less than two inches thick, and cored gypsum blocks not less than three inches thick. The fireproofing material shall be in contact with the member to be protected, or the spaces between the fireproofing and the member to be protected shall be filled with concrete* or mortar.

(c). No fireproofing material for the protection of iron or steel columns shall be less than two inches thick in any case; provided that the outer edges of lugs and brackets may extend not nearer than one and one-half inches to the outer surface of the protecting material.

(d). Where the fireproofing of columns is exposed to damage from trucking or handling of merchandise, it shall be jacketed for a height of five feet from the floor with a substantial covering.

(e). Beams and girders shall be individually protected by fireproofing materials not less than two inches thick at any point when supporting a wall or part thereof or a sidewalk, and not less than one and one-half inches thick in any case.

(f). Lintels over openings in walls shall be protected as required* for beams*; provided that when the span does not exceed four feet or such opening is spanned by an adequate masonry arch above the lintel the fireproofing may be omitted. Stone lintels shall not be used in fireproof-construction* unless supplemented with iron or steel lintels, capable of taking the full load, or with suitable masonry arches.

(g). Members of steel trusses shall be protected by fireproofing materials to provide a fire-resistance rating of not less than four hours; provided that such protection may be omitted from such trusses and from roof beams and purlins when such trusses support only roof loads and ceilings over floor areas having a clear height

*See definition, Section 200.

Section 1002

of not less than twenty-five feet below the lower chords of the trusses, and there is a continuous ceiling having a fire-resistance rating of not less than one hour directly below and supported by such trusses, through which there shall be no openings unless they open into shafts* or ducts to the roof, the enclosing walls of which have a fire-resistance rating of not less than one hour.

(h). No pipes, wires, cables or other service equipment shall be embedded in the required* fireproofing of columns or other structural members, nor shall they be between the required* fireproofing and the member protected.

(i). Beams or other steel members supporting or constituting part of floors or roofs, shall be rigidly connected to one another or to girders or columns; and shall be tied together by steel rods or other shapes; provided that when the floor-filling* or floor or roof construction is in the form of reinforced slabs which extend at least two inches below the upper flanges of the beams, and in which the reinforcement is continuous over the supports or securely attached to the same, ties may be omitted.

NOTE.—Re tie rods see §808-10.

5. Floors and roofs.

(a). When the floor-filling* or the floor construction between floor beams or roof beams in steel frame construction consists of arches or slabs they shall be constructed as follows:

(b). When brickwork is used it shall consist of segmental arches having a thickness of not less than eight inches for spans exceeding five feet nor less than four inches for spans of five feet or less. The rise shall be not less than one inch for each foot of span.

(c). When hollow clay tile is used the thickness of shells and webs of each block shall be not less than five-eighths of an inch; and interior vertical and horizontal webs of arch blocks shall not be spaced more than four inches apart. Skewbacks shall be of a form and section to fit accurately the beams and receive properly the thrust of the arches. In segmental arches the blocks shall be not less than six inches in depth with at least

*See definition, Section 200.

two cellular spaces in such depth; and the rise shall be not less than one inch for each foot of span. In flat arches, the depth of the blocks, unless reinforced with steel, shall be not less than one and one-half inches for each foot of span, exclusive of the portion of the block projecting below the underside of the beams.

(d). When concrete is used as floor-filling* it shall be not less than four inches thick, except as hereinafter provided in this subdivision. In the case of slab construction it shall be reinforced with steel rods or other suitable steel shapes, or steel fabric, placed at least one inch above the bottom of the slab. In segmental concrete arches the rise shall be not less than one inch for each foot of span.

NOTE.—See Appendix O.

(e). When gypsum, poured in place, is used as floor-filling* it shall be not less than four inches thick; and shall be reinforced with steel, no part of which shall be placed nearer than three-fourths of an inch to the underside of the slab.

(f). Each beam, joist, or girder constituting part of a floor construction shall be individually protected by fireproofing materials as elsewhere specified in this section.

(g). For mansards and dormers, roofs of bulkheads* and roofs having a pitch of more than thirty degrees with the horizontal, blocks of burnt clay, concrete or gypsum, not less than two inches thick, resting on steel shapes spaced not more than one foot for each inch of thickness in the block, may be used instead of the construction prescribed in this section for floors and roofs.

6. Partitions.

(a). Only incombustible materials shall be used in the construction of corridor partitions, of partitions enclosing toilet compartments and other service compartments and of partitions separating the spaces occupied by separate tenants; but this shall not prohibit the use of wooden doors, door casings, frames, jambs and bucks, window and transom frames and casings in these partitions, unless required* to be fire-partitions.*

*See definition, Section 200.

Sections 1002—1003

(b). Nothing in this section shall prevent the erection of temporary partitions of wood and glass within room or spaces, not exceeding five thousand square feet in area, occupied by a single tenancy.

7. Interior finish.

(a). Where wooden sleepers are used for laying wooden floors, the space between the floor slab and the underside of the wooden flooring shall be filled with incombustible material in such a manner that there will be no open spaces under the flooring which will exceed one hundred square feet in area, and such spaces shall be filled solidly under all permanent partitions.

(b). Wooden or other combustible flooring shall be secured to a floor of fireproof-construction*, except that flooring of wood, linoleum, rubber, tile, or cork may be secured to a sub-floor of wood.

(c). Wooden trim may be used for door or window casings, chair rails, picture moldings and baseboards when backed solidly with incombustible material.

(d). Wooden wainscoting and other surface coverings may be used on walls, partitions and ceilings when applied direct or to nailing strips and without concealed spaces; provided that such material used in a room or space exceeding five thousand square feet in area, shall have been treated to render it non-flammable.

(e). Combustible acoustical material and other interior finish shall not be applied to the walls, partitions or ceilings of buildings* occupied* as theatres, auditoriums, schools or other places of assembly, unless they have been treated to render them non-flammable.

SECTION 1003. SEMIFIREPROOF CONSTRUCTION.

1. General.

(a). Any form of construction that develops the required* fire-resistance in the standard-fire-test* shall be acceptable in semifireproof-construction*.

*See definition, Section 200.

(b). The forms of construction described in this section shall be deemed to provide the minimum fire-resistance required* for semifireproof-construction*; but their use shall not be precluded as affording greater fire-resistance, if they have developed the required* fire-resistance in the standard-fire-test*.

(c). Any form of construction acceptable for fire-proof-construction* shall be acceptable for the same purpose in semifireproof-construction*.

2. Structural iron and steel.

(a). Iron and steel columns placed within exterior walls or along the outer lines of a building* shall be protected by approved-masonry* not less than four inches thick; provided that the interior faces may be protected as hereinafter specified for columns in the interior of the building*.

(b). For the protection of iron or steel columns in the interior of a building*, brickwork shall be not less than three and three-quarter inches thick; concrete shall be not less than two inches thick; hollow clay tile shall be not less than two inches thick and, when single shell tile is used, it shall be plastered on the exposed surfaces with gypsum-mortar* or cement-mortar* at least one-half inch in thickness, or, when double shell tile is used, it may be unplastered; poured gypsum shall be not less than one and one-half inches thick; solid gypsum blocks shall be not less than two inches thick; and hollow gypsum blocks shall be not less than three inches thick. All spaces between the required* fire-proofing and the member protected must be fire stopped at each floor level.

(c). In no case shall the protecting material of iron or steel columns be less than one and one-half inches thick. The extreme outer edges of lugs, brackets or other supporting parts of columns shall not extend nearer than one inch to the outer surface of the protection.

*See definition, Section 200.

Section 1003

(d). For iron or steel girders or lintels supporting walls, the brickwork, concrete, hollow clay tile or gypsum used as fire protection, shall be not less than two inches thick; provided that when the span does not exceed six feet or such opening is spanned by an adequate masonry arch above the lintel the fireproofing may be omitted.

(e). For iron or steel girders or beams, except when supporting walls, the brickwork, concrete, hollow clay tile or gypsum used as fire protection, shall be not less than one and one-half inches thick; or such girders or beams may be protected by gypsum-mortar* or cement-mortar*, one and one-half inches thick on expanded metal lath weighing not less than three pounds per square yard.

(f). Trusses, unless protected as provided in this article for fireproof-construction*, may be protected on the sides and below the bottom chords with expanded metal lath and gypsum-mortar* or cement-mortar* not less than one inch thick.

(g). No pipes, wires, cables or other service equipment shall be embedded in the required* fireproofing of columns or other structural members, nor shall they be between the required* fireproofing and the member protected.

(h). Where the fireproofing of columns is exposed to the damage of trucking or the handling of merchandise, it shall be jacketed for a height of five feet from the floor with substantial covering.

3. Floors and roofs.

(a). Reinforced-concrete* slabs, as part of reinforced-concrete* construction in which the concrete joists are spaced not more than twenty-four inches apart, shall be not less than two and one-half inches thick.

*See definition, Section 200.

(b). Reinforced-concrete* slabs supported by steel beams protected by fireproofing materials as required by this section shall be not less than two and one-half inches thick when the beam spacing does not exceed thirty inches on centers, nor less than three and one-half inches thick for greater beam spacing.

(c). Steel beams or approved* steel joists which are not individually protected by fireproofing materials as specified in this section, shall be of uniform depth in each floor bay and shall be protected on the under side by a ceiling of expanded metal lath and gypsum-mortar* or cement-mortar* not less than one inch thick, and on the upper side with a concrete or gypsum slab not less than two inches thick.

(d). Steel beams or joists shall be tied together by steel rods or by rigid steel bridging of proper size, spacing and location.

4. Partitions.

(a). Unless otherwise specifically required* partitions may have wooden doors, door casings, frames, jambs and bucks, window and transom frames and casings.

(b). If combustible material enters into the construction of partitions, they shall be built to have a fire-resistance rating of not less than one hour.

(c). Wooden studs covered both sides with expanded metal lath and three-quarters inch gypsum-mortar* or cement-mortar* shall be deemed to have the required* fire-resistance rating.

(d). Nothing in this section shall prevent the erection of temporary partitions of wood and glass or of metal and glass within the rooms or spaces occupied by a single tenancy.

*See definition, Section 200.

Sections 1003—1004

5. Interior finish. Wooden wainscoting and other surface coverings may be used on walls, partitions and ceilings when applied direct or to nailing strips and without concealed spaces; provided that such material used in a room or space exceeding five thousand square feet in area, shall have been treated to render it non-flammable.

SECTION 1004. HEAVY TIMBER CONSTRUCTION.

1. Walls.

(a). Walls shall be of brick laid in cement-mortar* or cement-lime-mortar*, or of concrete*. Walls over openings shall be supported by masonry arches, or by lintels of steel or reinforced-concrete*.

(b). Steel lintels over openings more than four feet wide shall be protected as provided in this article for semifiireproof-construction*.

NOTE.—See §1003-2d.

2. Columns.

(a). Wooden columns shall be not less than eight inches, nominal, in any dimension. All corners shall be rounded or chamfered.

(b). Column and girder connections shall be of fire-resistive construction or protected by approved* materials and methods having a fire-resistance rating of not less than one hour. Wooden bolsters may be used only to support roofs.

(c). Steel and cast iron columns may be used if protected as provided in this article for fireproof-construction* or semifiireproof-construction*.

NOTE.—See §1002-4 and §1003-2.

(d). Columns shall not rest on floor timbers; nor shall they rest on masonry foundations unless stone, cast iron or steel bases are used to transmit their loads.

3. Beams and girders.

(a). Beams and girders of wood shall be not less than six inches in least dimension nor less than ten

*See definition, Section 200.

inches in depth. If built up of two or more pieces they shall be properly bolted together and precaution shall be taken to prevent decay of contact faces.

(b). Wall plates, boxes of self-releasing type or approved* hangers, shall be provided where beams or girders rest on walls.

(c). Where girders meet columns they shall be fitted around them or butted up close to them. The ends of girders shall be held in place by steel or iron

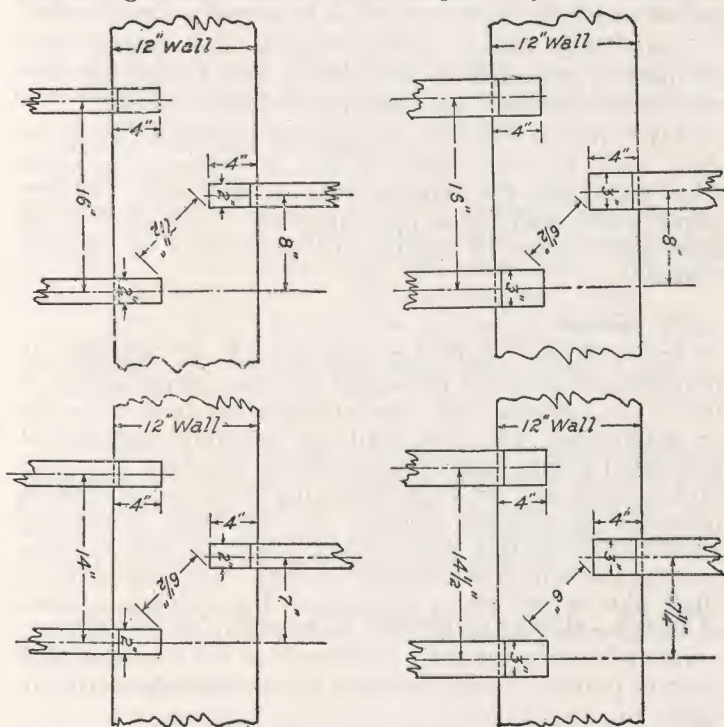


FIG. 7.

Arrangement of wooden floor joists in a wall to secure a separation of at least six inches between the ends, §809-5a. In heavy-timber-construction a separation of eight inches is required, §1004-3f.

*See definition, Section 200.

Section 1004

straps, spiked, bolted or lag screwed on their sides unless the post caps have sides projecting upward which can be lag screwed to the girders.

NOTE.—See §1002-4, and §1003-2.

(d). Where intermediate beams are found necessary for the support of a floor, they shall rest on top of the girders; or they may be supported by approved* steel or iron hangers into which the ends of beams shall be closely fitted. Interstices between beams framed together shall be filled in with a preservative compound.

(e). Steel beams, girders, lintels and trusses may be used if protected as provided in this article for fire-proof-construction* or semifireproof-construction*.

(f). Wooden beams and girders supported by walls shall have at least eight inches of masonry between their ends and the outside face of the wall. Where beams enter walls from opposite sides, there shall be at least eight inches of masonry between sides of adjacent beams.

4. Floors.

(a). Floors shall be constructed of splined or tongued and grooved plank not less than three inches in thickness, covered with one-inch flooring laid crosswise or diagonally; but this shall not preclude the use of laminated floors, consisting of planks not less than four inches wide, set on edge close together and spiked at intervals of eighteen inches. In laminated floors the planks shall be laid with broken joints so that no continuous line will occur across the floor. Laminated floors shall not be spiked to the supporting girders. Joints of the planking shall be over supports or at the quarter points with no more than two-thirds of the joints at such quarter points. Joints between planks shall be perfectly tight.

NOTE.—It is recommended that the floors be given a pitch of about one inch in twenty feet to points of discharge to relieve the floors of the weight of water from automatic sprinklers and hose, and avoid, as much as possible, water drainage to floors below. See §810-10.

*See definition, Section 200.

(b). Flooring shall not extend closer than one-half inch to walls, and the space thus left shall be covered by a moulding which will not obstruct an expansive movement of the floor due to wetting; or the masonry may be corbeled under the floor planks to cover this space.

(c). Floors shall have the least possible number and amount of openings, and these shall in all cases be protected by shafts* or in some other approved* manner.

5. Roofs. Roofs shall be constructed the same as floors except that the plank shall be not less than two and one-half inches thick, and beams supporting the roof shall be not less than six inches in either dimension.

NOTE.—Requirements for the anchoring of the roof construction are given in §809-li.

6. Power drives. All belt or rope drives used to transmit power from one story to another, shall be located in belt towers. Such towers shall be constructed as shafts*. Shaft holes and belt drive holes through walls shall be protected with self-closing* doors.

NOTE.—Details of protective construction for belt drives may be found in "Protection of Main Belt Drives with Fire Retardant Partitions" in Proceedings of American Society of Mechanical Engineers for 1913.

Re shafts see §1009.

7. Condition of timber. Wood used in heavy-timber-construction* shall be thoroughly seasoned and dry and shall be installed in such manner as to prevent dry rot or rapid decay. No paint or finish of any kind shall be applied until timbers are thoroughly seasoned.

SECTION 1005. FIREWALLS AND PARTY WALLS.

1. Construction.

(a). Firewalls* shall be constructed of solid brick masonry laid in cement-mortar* or cement-lime-mortar*, or of reinforced-concrete*.

(b). When constructed of solid brick masonry, the thickness of firewalls* shall be not less than required*

*See definition, Section 200.

Section 1005

for exterior bearing-walls*; provided that in business-buildings* and storage-buildings* exceeding twenty feet in height*, no part of the wall shall be less than sixteen inches thick.

NOTE.—For thickness of bearing walls see §806-9.

(c). When constructed of reinforced-concrete* the thickness of firewalls* of business-buildings* and storage-buildings* shall be not less than eleven inches for the uppermost twenty-five feet of their height*, and shall increase two inches in thickness for each successive twenty-five feet or fraction thereof measured downward from the top of the wall; and for other buildings* the thickness shall be not less than nine inches for the uppermost thirty-five feet of their height* and shall increase three inches in thickness for each successive thirty-five feet or fraction thereof measured downward from the top of the wall.

(d). Party-walls* shall be constructed of solid brick masonry laid in cement-mortar* or cement-lime-mortar*, or of reinforced-concrete*, not less in thickness than required* for firewalls*; provided that walls supported by girders at each story* shall be not less than twelve inches thick when constructed of masonry, nor less than eight inches thick when constructed of reinforced-concrete*.

NOTE.—See also §806-9n. For restrictions see §806-5g.

(e). Firewalls* and party-walls* shall extend at least three feet above the roof.

2. Openings.

(a). Except in sprinklered* buildings*, no opening in a firewall* shall exceed eighty square feet in area, and the aggregate width of all openings at any level shall not exceed twenty-five per cent of the length of the wall.

NOTE.—Detailed specifications for the protection of openings in firewalls may be found in "Regulations for the Protection of Openings in Walls and Partitions Against Fire" of the National Board of Fire Underwriters.

*See definition, Section 200.

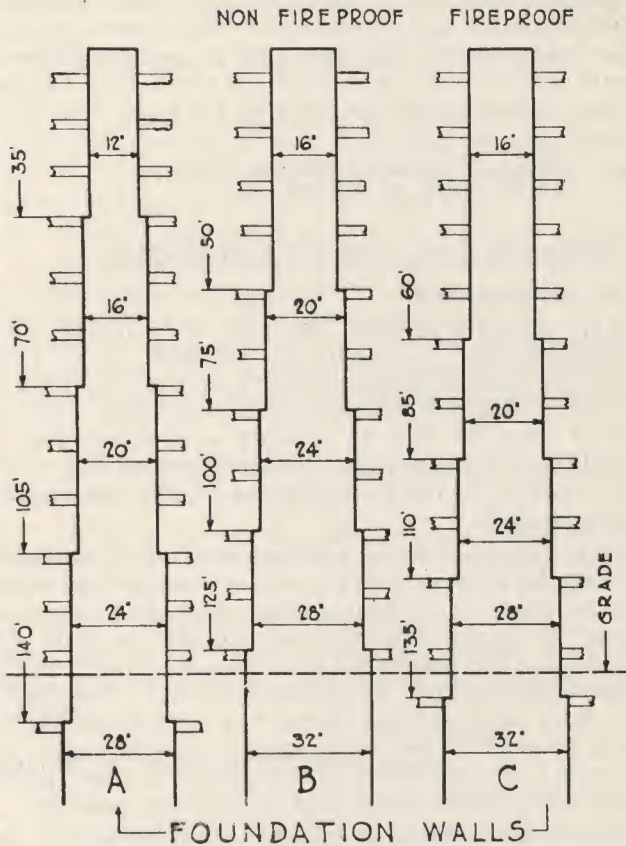


FIG. 8.

Thicknesses of firewalls and party-walls, §1005-1: A—solid brick masonry walls of residence buildings, institutional buildings and public buildings; B—solid brick masonry walls of business buildings and storage buildings, of other than fireproof construction; C—solid brick masonry walls of business buildings and storage buildings, of fireproof construction.

(b). Every opening in a required* firewall* shall be protected on each side of the wall with an approved* automatic* fire door; provided that when a firewall* serves also as a horizontal exit it shall have no openings other than door openings not exceeding forty-eight square feet in area, and one of the automatic* fire doors at each opening shall be replaced by a self-closing* fire door.

NOTE.—Re horizontal exits see §606.
Re fire doors see Appendix B.

SECTION 1006. FIRE PARTITIONS.

1. Construction.

(a). Fire-partitions* shall be constructed of approved-masonry* or reinforced-concrete*, or of a form of construction of incombustible materials having a fire-resistance rating of not less than two hours. Fire-partitions* may be used as bearing-walls* provided that, in addition to meeting the requirements of this section, they conform to the requirements of this ordinance for bearing-walls*.

(b). The following constructions shall be deemed to have the necessary fire-resistance for fire-partitions*: clay or shale brick four inches thick laid in cement-mortar* or cement-lime-mortar* plastered on both sides; hollow clay tile six inches thick laid in cement-mortar*, cement-lime-mortar* or gypsum-mortar*, plastered on both sides with gypsum-mortar* or cement-mortar* not less than one-half inch in thickness, and having at least two cells in the thickness of the partition; cored gypsum blocks four inches thick laid in gypsum-mortar*.

(c). Such partitions shall be supported in each story* on construction having a fire-resistance rating of not less than two hours; provided that when they also serve as bearing-walls*, the supporting construction shall have a fire-resistance rating of not less than four hours in case the building* is of fireproof-construction* or semifireproof-construction*, and not less than three

*See definition, Section 200.

hours in case the building* is of heavy-timber-construction* or ordinary-construction*.

NOTE.—For acceptable forms of construction having a two-hour rating see §1003-2e; for a four-hour rating see §1002-2.

2. In buildings of heavy-timber and ordinary construction.

(a). In buildings* of heavy-timber-construction* or of ordinary-construction*, fire-partitions*, if required* in a story* as a horizontal exit, shall be continuous through all stories* from the foundation to the roof.

(b). Such fire-partitions* shall be deemed continuous, even though the several parts are not directly over one another in successive stories* if the intervening parts of the floors at the levels where offsets occur, are unpierced and of fireproof-construction* or semifireproof-construction* and all parts not supported directly on the foundations are carried on fireproof-construction*.

3. Openings.

(a). Fire-partitions* shall have no openings other than required* door openings.

(b). Every opening in a fire-partition* serving as a horizontal exit shall be protected by an approved* self-closing* fire door.

NOTE.—Re fire doors see Appendix B.

(c). Other openings in fire-partitions* shall be equipped with approved* fire doors set in approved* door frames.

SECTION 1007. FIRESTOPPING.

1. General. Firestopping shall be arranged to cut off all concealed draft openings and form an effectual horizontal fire barrier between stories*, and between a top story* and the roof space.

2. Furred walls.

(a). In buildings* of ordinary-construction* when the walls are furred, the masonry between the ends of the wooden joists shall project the thickness of the fur-

*See definition, Section 200.

Section 1007

ring beyond the inner face of the wall for the full depth of the joists; or a course of masonry above and below the joists, shall project the full thickness of the furring beyond the face of the wall; or the space between the wooden joists above the furring, for the full depth of the joists, shall be filled in with approved* incombustible material extending from the wall not less than the thickness of the furring.

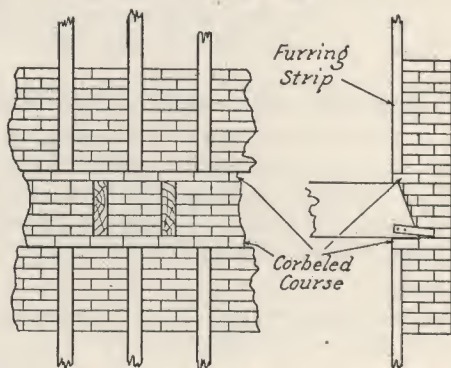


FIG. 9.

Method of firestopping wood furred brick walls, §1007-2a.

(b). When joists run parallel to the wall the space between the wall and nearest joist shall be not less than two and one-half inches and shall be solidly filled with masonry or approved* incombustible material.

3. Studded-off spaces. In buildings* of ordinary-construction* or frame-construction* where walls are studded-off, the space between the inside face of the wall and the studding directly over such space shall be firestopped with approved* incombustible material, for a depth of not less than four inches, securely supported.

4. Partitions.

(a). Interior stud partitions which are not provided with at least one two-inch plate at top and bottom of same width as stud, shall be otherwise properly firestopped at the top of the studs.

*See definition, Section 200.

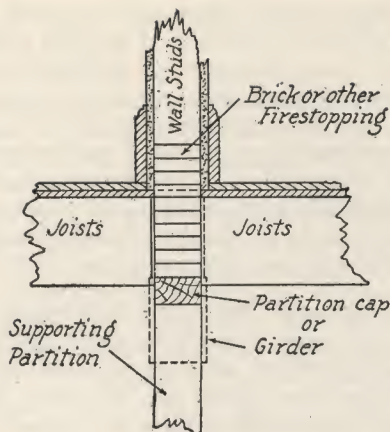


FIG. 10.

Firestopping of partitions, §1007-4.

(b). When sliding doors are pocketed in partitions, such pockets shall be completely firestopped at the top, bottom and ends.

5. Exterior walls. Exterior walls of frame-construction* shall be properly firestopped at each floor level,

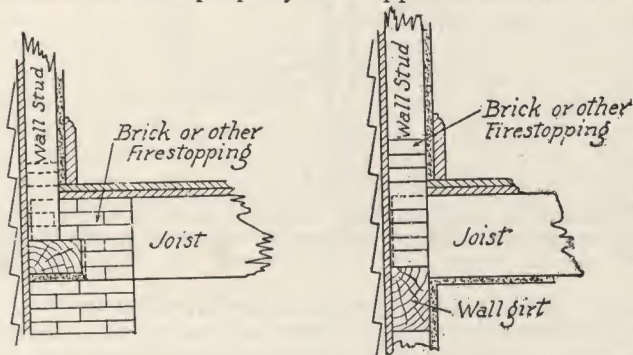


FIG. 11.

Firestopping in exterior walls of frame construction at floor levels. §1007-5.

*See definition, Section 200.

Section 1007

at the roof level in the case of flat roofs, and at the foot of roof rafters in the case of sloping roofs.

6. **Stairs.** In buildings* of ordinary-construction* the space between stair strings or carriages, when the stairs are of wood-construction, shall be firestopped at intervals not exceeding eight feet; and the soffits of such stairs shall be constructed of gypsum-mortar* or cement-mortar* on expanded metal lath, or of gypsum lath three-eighths of an inch in thickness plastered with unsanded gypsum plaster not less than one-half inch thick.

7. Pipes, shafting, belts and conveyors.

(a). All openings around exposed pipes or power shafting shall be filled with approved* incombustible material, or shall be closed off by close fitting metal caps at the ceiling and floor line or on each side of the wall.

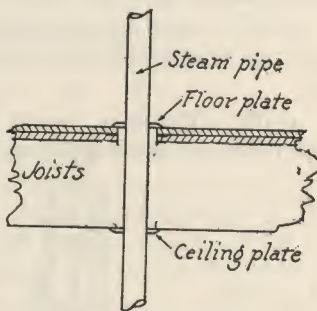


FIG. 12.

Protection of pipe openings through floors, §1007-7a. When floors are waterproofed or drainage by scuppers is provided, the sleeve should extend six inches above the floor. §1210-1a.

(b). All openings for belts and conveyors shall be provided with approved* slotted doors, or be otherwise closed off. Belts shall not pass through firewalls*.

8. **Inspection.** No firestopping shall be covered or concealed until inspected by the building-official*.

*See definition, Section 200.

SECTION 1008. PROTECTION OF OPENINGS.

1. When required.

(a). Every building*, except dwellings*, churches and buildings* of frame-construction*, shall have approved* fire windows or other approved* protectives, in every opening in the exterior walls when such opening faces on a street* and is less than fifty feet from the opposite building-line*, or when such opening is less than fifty feet distant in a direct unobstructed line from an opening in another building*, or when such opening is above and not more than fifty feet distant from any part of a neighboring roof; provided that such protection shall not be required for show windows facing on a street* which do not extend above the first full story* above grade*; and provided further that such protection shall not be required when the opening to be protected and the opening against which it is to be protected are situated in walls in the same plane or in parallel planes and are facing in the same direction.

(b). For the purpose of this section, when a building* is divided by firewalls* into two or more sections, each section shall be regarded as a separate building*.

(c). Fire doors, fire windows, fire shutters, open sprinklers and other protectives, enumerated in the "List of Inspected Fire Protection Appliances" of Underwriters' Laboratories, Inc., as suitable for given locations and conditions, and installed in accordance with the regulations of the National Board of Fire Underwriters, as amended from time to time, for the "Protection of Openings in Walls and Partitions against Fire," shall be deemed to be approved within the meaning of this section.

2. Vertical separation. Except in buildings* of ordinary-construction*, exterior openings that are located vertically above one another and which are not protected by automatic* fire windows or doors or fire windows with fixed sash shall have not less than three feet

*See definition, Section 200.

of solid masonry between the top of one opening and the bottom of the one next above. No such opening shall be within one foot of the ceiling of the story* in which it is located.

3. Fire shutters.

(a). When equipped with fire shutters of the swinging type, at least one in every three openings facing a street* in each story* shall have such shutters arranged to be readily opened from the outside. Distinguishing marks shall be provided on these shutters.

(b). Fire shutters of the rolling type shall be carefully counterbalanced and so arranged that they can be readily opened from the outside.

4. Exit openings. When fire doors or fire shutters are used on openings to exits or fire escapes they shall be so arranged as not to obstruct such exits or fire escapes.

5. Wired glass. For the glazing of fire doors, when permitted, or fire windows only wired glass not less than one-quarter inch thick shall be used.

NOTE.—For situations in which the use of wired glass is suitable and the limitations that should control its use, see Appendix B.

6. Closing of protectives. Fire doors, fire shutters and fire windows on exterior openings, when not required to be open, shall be closed by the occupant or occupants of the building having the use or control of them.

7. Protection of interior openings. Whenever the building-official* shall declare in a written order that an existing hazardous condition requires it, openings in interior walls of masonry or reinforced-concrete* shall be equipped with approved* automatic* or self-closing* fire doors as may be designated.

SECTION 1009. SHAFTS.

1. When required.

(a). Every series of openings above one another in

*See definition, Section 200.

two or more successive floors, or floors and roof, hereafter* placed or constructed in a building* or hereafter* enlarged or altered to change the use of the shaftway shall be enclosed to constitute a shaft*; provided that in buildings* of heavy-timber-construction* there shall be no floor opening that is not protected by a shaft* as prescribed in this section or in some other approved* manner.

(b). The provisions of this section shall apply to all shaftways used for ventilation, light, elevator* or other purpose, except stairways*, ducts, incinerator chutes and flues, shaftways in buildings* of frame-construction*, and shaftways in residence-buildings* of ordinary-construction* extending from the ceiling of the top story* to and above the roof.

NOTE.—Re enclosures for stairways see §604-2; re warm air ducts see §1208; re ducts of blower or exhaust systems see §1204-2; re chutes and flues of incinerators see §1206.

2. Open shafts.

(a). The enclosing walls of shafts* that are open to the outer air at the top shall be constructed of approved-masonry* or reinforced-concrete*.

NOTE.—Except as modified by the next paragraph, "b", the required thicknesses of walls of open shafts are the same as the thicknesses required for walls generally. See §806-1 and §806-9.

(b). When the enclosing walls of shafts* open to the outer air at the top do not extend ten feet in length in a horizontal direction, they may be eight inches thick for the uppermost thirty-five feet and four inches more for each lower section of thirty-five feet of their height*.

3. Interior shafts. The walls of shafts*, unless constructed of approved-masonry* or reinforced-concrete* shall be fire-partitions*; provided that shafts* in residence-buildings* of ordinary-construction* may be constructed of hollow clay tile, stone or cinder concrete, gypsum blocks, gypsum mortar or cement-mortar* on metal lath, or any material and form of construction that has a fire-resistance rating of not less than one

*See definition, Section 200.

Section 1009

hour; and provided further that such walls shall be not less than two inches thick and set in an angle iron frame or otherwise substantially supported on incombustible construction properly fire protected.

NOTE.—For acceptable forms of construction as one-hour partitions see §1003-4.

4. Openings.

(a). Shafts* shall have no openings other than such as are necessary for the purpose of the shaftway; provided that in shaftways for elevators* there shall be at least one door in every thirty feet of the height of such shaftway.

NOTE.—In shafts for express elevators which make long runs without stop, doors at intervals of at least thirty feet are necessary for emergencies, when the cars may be caught somewhere in the shaft.

(b). Such openings shall be protected with approved* fire doors, approved* fire shutters or approved* fire windows.

NOTE.—Re doors, windows and shutters see Appendix B.

5. Enclosure at top.

(a). Every shaft* extending into the top story* of a building* of heavy-timber-construction* or ordinary-construction* shall be carried through and not less than three feet above the roof.

(b). Every shaft* extending above the roof, except open shafts*, shall be covered at the top with a skylight of at least three-fourths of the area of the shaftway in the top story*; provided that the skylight herein required may be replaced by a window of equivalent area in the side of the shaft* if the sill of such window is not less than two feet above the roof and the window does not face a lot-line* within ten feet.

NOTE.—For construction having a two-hour rating see §1003-3.

(c). A shaft* that does not extend into the top story* shall have the top enclosed with fireproof-construction*.

*See definition, Section 200.

6. **Enclosure at bottom.** A shaft* that does not extend to the bottom of the building* shall be enclosed at its lowest point with a floor construction of the same type as that required* for the lowest floor to or through which it passes; provided that, in any case, it shall have a fire-resistance rating of not less than one hour.

7. **Elevator machinery compartment.** When a compartment which contains machinery for operating an elevator* is not separated from the elevator shaft* by fireproof-construction* or semifireproof-construction*, it shall be enclosed with fire-partitions*, and openings in such fire-partitions* shall be equipped with approved* fire doors.

8. **Number of elevators in shaftway.** Not more than three elevators* shall be placed hereafter* in one shaft*.

9. **Existing shaftways.**

(a). In an existing building* in which there is a shaftway not already enclosed as in this article prescribed for shafts*, the openings in each floor shall be protected by substantial guards or gates and shall be provided with approved* trapdoors as may be directed by the building-official*.

(b). Such trapdoors shall be constructed so as to form a substantial floor surface when closed; if there is an elevator*, they shall be so arranged as to open and close by the action of the elevator* in ascending or descending.

(c). Guards or gates, and trapdoors required by this section shall be kept closed at all times, when the shaftway is not in actual use.

SECTION 1010. ROOFING.

1. **Materials.**

(a). Every roof hereafter* placed on a building* shall be covered with an approved* roofing of brick, concrete, tile, slate, metal, asbestos, or built-up roofing

*See definition, Section 200.

Section 1010

finished with asphalt, slag or gravel, or with other approved* material.

(b). Except where roofing is of a character permitting attachment direct to steel frame work, it shall be applied to a solid or closely fitted deck.

NOTE.—See Appendix L.

(c). Roofings which are classified as Class A or B under the test specifications of Underwriters' Laboratories, Inc., shall be accepted as meeting the requirements of this section.

NOTE.—See Appendix B.

(d). For buildings* which are occupied* as dwellings*, for buildings* which are of frame-construction*, or, outside the fire-limits*, for other buildings* which do not exceed two stories* or thirty feet in height* nor twenty-five hundred square feet in area* and are not occupied* as mercantile establishments, factories or warehouses, roofings which are classified as Class C under the test specifications of Underwriters' Laboratories, Inc., shall be accepted as meeting the requirements of this section.

NOTE.—See Appendix B.

2. Repairs.

(a). No roofing on an existing roof shall be renewed or repaired to a greater extent than one-tenth of the roof surface, except in conformity with the requirements of this section.

(b). The placing of new roofing conforming to this section over existing combustible roofing shall not be prohibited; provided the existing roofing is removed for a distance of four inches along all edges of the roof and replaced by strips of weatherproof material over which the new roofing shall extend.

(c). All wooden shingles and other combustible roofings heretofore* placed on buildings* or structures* within the fire-limits*, unless covered as provided in paragraph "b" of this subdivision, shall be removed be-

*See definition, Section 200.

fore..... and shall be replaced by a roofing conforming to the requirements of this section.

NOTE.—In the blank space of this paragraph an appropriate date should be inserted. This date should be made as early as consistent with securing to the owners of the buildings a reasonable service for roofs which may have been constructed shortly prior to the adoption of this code. As a reasonable period to be allowed within which to make the changes, twelve to fifteen years is suggested.

3. Cornices.

(a). Cornices, including those on show windows, hereafter* placed on the exterior of buildings* within the fire-limits* or on buildings* over fifty feet in height* outside the fire-limits* shall be of incombustible materials.

(b). Except on buildings* of frame-construction*, cornices on buildings* outside the fire-limits* shall be covered with incombustible material when nearer than three feet to a lot-line* other than a street-line*, or when within five feet of another building*; provided that cornices attached to parapet walls may be of wood.

4. Gutters and leaders. Gutters and leaders hereafter* placed on buildings*, other than dwellings*, private-garages* or buildings* of frame-construction*, shall have weather surfaces of incombustible material.

5. Scuttles.

(a). Unless provided with some other means of access to the roof, every building* more than fifteen feet in height*, except dwellings* with peak roofs and industrial buildings* not over forty feet in height at the eaves, shall have in the roof a scuttle or trapdoor with a ladder leading thereto from the top story*.

(b). Such scuttles or trapdoors shall be covered on the top and edges with sheet metal or other approved* fire-resistive material. The openings for same shall be at least two feet by three feet in size.

*See definition, Section 200.

SECTION 1011. ROOF STRUCTURES.

1. **General.** All construction, other than aerial supports not over ten feet high, flag poles, water tanks and cooling towers, hereafter* placed above the roof of a building* within the fire-limits* or over the roof of a building* more than fifty feet in height* wherever located, shall be of incombustible materials.

2. Bulkheads.

(a). The walls of bulkheads* hereafter* erected on buildings* of fireproof-construction* or semifireproof-construction* shall be constructed as fire-partitions*. The roofs of such bulkheads* shall have a fire-resistance rating of not less than two hours.

NOTE.—For acceptable forms of construction for roofs having fire resistance ratings of two hours see §1003-3.

(b). The walls and roofs of other bulkheads*, unless constructed of approved-masonry*, shall be covered on the outside with fire-resistive, weatherproof material.

3. Pent houses.

(a). A pent-house* shall be considered a story* of the building*.

(b). When an exterior wall of a pent-house* sets back five feet or more from the exterior walls of the next lower story* it may be constructed as a fire-partition*, covered on the outside with fire-resistive, weatherproof material, and supported by steel or reinforced-concrete* girders; otherwise the walls shall conform to the requirements for exterior walls of approved-masonry*.

4. Skylights.

(a). Skylights which are inclined more than sixty degrees from the vertical, hereafter* placed on a building* shall have the sashes and frames thereof constructed of metal; except that skylights in foundries or buildings* where acid fumes are present as an incident to the occupancy of the building*, may be of wood by special permission of the building-official*.

*See definition, Section 200.

(b). Skylights placed over shaftways shall be glazed with plain glass not more than three-sixteenths of an inch in thickness.

(c). Every skylight in which plain glass is used shall be protected by a substantial wire screen placed not less than four inches nor more than ten inches above the glazed portion of the skylight at all points. Such screen shall extend beyond the glazing on all sides a distance not less than the height of the screen above the glazing.

(d). When such skylight is located over a stairway*, passageway*, public hallway or a room of public resort a similar screen shall also be placed below the skylight, unless there is an intermediate ceiling light.

5. **Mansard roofs.** Mansard or other slanting roofs having a pitch of more than sixty degrees, hereafter* placed on a building* over forty feet in height* shall be of fireproof-construction* or semifireproof-construction*.

NOTE.—For fireproof construction see §1002-5 and particularly paragraph "h"; for semifireproof construction see §1003-3.

6. **Dormer windows.** Dormer windows hereafter* erected shall be of the same type of construction as the roof on which they are placed or of the side walls of the building*. The top and sides shall be covered with materials prescribed in this article for roofing.

NOTE.—See preceding paragraph and note under same.

7. Tanks.

(a). Tanks of more than five hundred gallons capacity hereafter* placed in or on a building* shall be supported on masonry, reinforced-concrete* or steel construction; provided that when such steel construction is within the building* it shall be protected as required* for fireproof-construction*.

(b). Such tanks shall have in the bottom or on the side near the bottom, a pipe or outlet, not less than four inches in diameter, fitted with a suitable quick-

*See definition, Section 200.

opening valve for discharging the contents in an emergency through an adequate drain.

(c). Such tanks shall not be placed over nor near a line of stairs or an elevator shaft*, unless there is a solid roof or floor underneath the tank.

(d). All unenclosed roof tanks shall have covers sloping toward the outer edges.

(e). When hoops are used in the construction of tanks they shall be of metal, round in cross-section and provision shall be made to guard against corrosion.

ARTICLE XI

CHIMNEYS AND FLUES

SECTION 1100. CHIMNEYS.

1. Construction.

(a). Chimneys hereafter* erected shall be of approved-masonry*, or of reinforced-concrete*.

(b). Such chimneys shall extend at least three feet above the highest point at which they come in contact with a roof of the building* and at least two feet higher than any ridge within ten feet of such chimney.

(c). Every such chimney shall be properly capped with terra cotta, stone, cast iron or other approved* incombustible, weatherproof material.

(d). Such chimneys shall be wholly supported on approved-masonry* or self-supporting fireproof-construction*.

(e). No such chimney shall be corbeled from a wall more than six inches; nor shall such chimney be corbeled from a wall less than twelve inches in thickness unless it projects equally on each side of the wall; provided that in the second story of two-story dwellings* corbeling of chimneys on the exterior of the enclosing walls may equal the wall thickness.

(f). No change in the size or shape of a chimney

*See definition, Section 200.

where the chimney passes through the roof, shall be made within a distance of six inches above or below the roof joists or rafters.

(g). All chimneys which are or have become unsafe or dangerous shall be repaired and made safe, or taken down.

NOTE.—For procedure to cause abatement of unsafe conditions see §106.

2. Flues required.

(a). Except electric heating appliances and as otherwise provided in this article for gas appliances, every heating apparatus or heat producing appliance referred to in this and the next following article shall be connected with a flue, conforming to the provisions of this article.

(b). No flue shall have smoke pipe connections in more than one story* of a building*, unless provision is made for effectively closing smoke pipe openings with devices made of incombustible materials whenever their use is discontinued temporarily, and completely closing them with masonry when discontinued permanently.

(c). Nothing in this ordinance shall prohibit the joining of two or more smoke pipes for a single flue connection; nor the venting of an automatic gas appliance to a flue serving appliances using other fuel; provided the gas appliance connection into such flue is made at a point not less than twelve inches above the connection from such other appliance; provided further that in every case the smoke pipes and flues are of sufficient size to serve all the appliances thus connected; and provided that, except for outlet pipes for gas appliances, the several smoke pipes shall be constructed to comply with the severest requirements for any one of those connected. An automatic gas appliance, within the meaning of this paragraph, is one that is equipped with a safety pilot light, the extinguishment of which will automatically shut off the supply of gas.

NOTE.—Re automatic gas appliances see §1105.

See also next paragraph "d."

*See definition, Section 200.

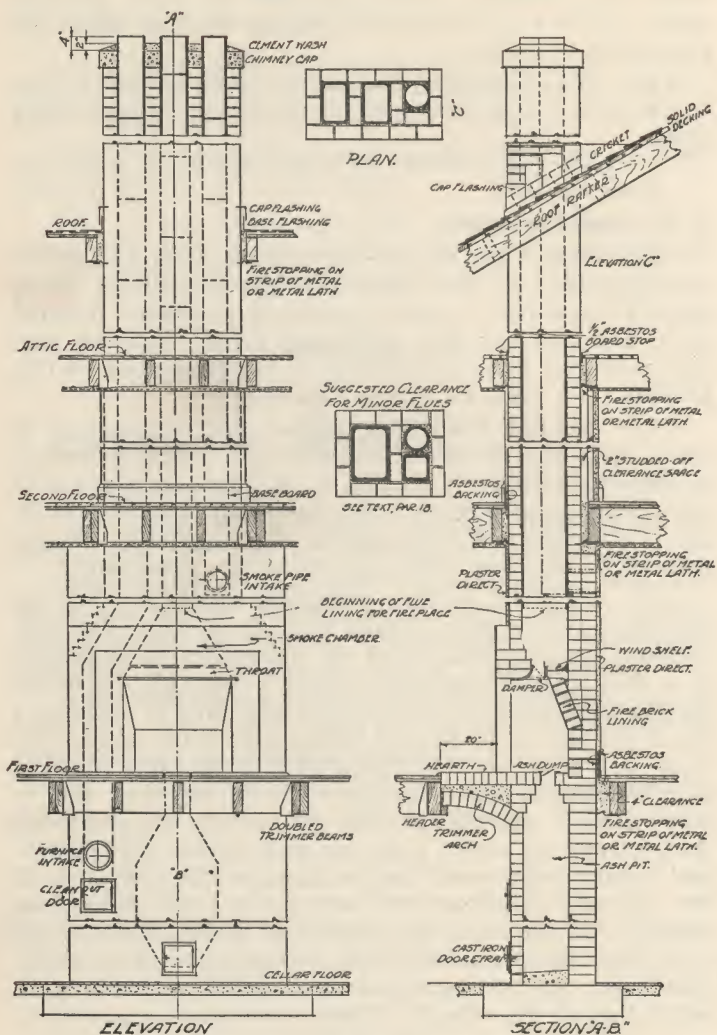


FIG. 13.

Standard Chimney Construction. Sec. 1100.

(d). Flues serving non-fuel fired incinerators in residence-buildings*, institutional-buildings*, churches, schools and restaurants, shall not have smoke pipe connections with any other appliance.

NOTE.—For requirements applying to flues for non-fuel fired incinerators see subdivision 7 of this section. See also §1206-2.

3. Flue linings.

(a). Required* flue linings shall be made of fire clay or other refractory clay to withstand, without softening, the temperatures to which they will be subjected, but not less than two thousand degrees Fahrenheit, or of cast iron of approved* quality, form and construction.

(b). Required* clay flue linings shall be not less than five-eighths of an inch thick.

(c). Flue linings shall be built in as the chimney construction is carried up, carefully bedded one on the other in mortar with close-fitting joints left smooth on the inside.

NOTE.—The practice of building up chimney walls hollow for a number of courses and then dropping a section of flue lining into this hollow space (a common practice in the past) should not be tolerated. Inspection of chimneys built in this way shows that this method of construction is the cause of leaky and hazardous flues having unsatisfactory draft.

Openings for smoke pipes into flues and clean-out openings should be built-in and not cut in after the flue construction has been completed. In cutting openings after the flue is completed, the flue lining is likely to be badly shattered and to cause obstructions in the flue. Some manufacturers of flue lining can furnish pipe with suitable intakes and thimbles already provided. Special crocks are sometimes made for smoke intakes.

When flues change their direction, the ends of the flue linings must be cut to make a proper fit at the angles or at the points of change in direction. This cutting is best done by placing an empty bag in the lining, filling the bag with damp sand and jamming it to fit the lining tightly. The length, standing on end, can then be cut with a chisel and light hammer. With a reasonable degree of care, proper intake connections, miters or angles can thus be made without shattering the lining.

(d). Flue linings shall start from a point not less

*See definition, Section 200.

Section 1100

than eight inches below the intake, or, in the case of fireplaces, from the throat of the fireplace. They shall extend, as nearly vertically as possible, for the entire height of the chimney.

NOTE.—It is recommended that flue linings be extended four inches above the top or cap of the chimney. This not only tends to prevent down draft but also sheds water from the masonry.

(e). When cleanouts for flues or fireplaces are provided, they shall be constructed the same as such flues or the flues serving the fireplace and shall be equipped with cast iron doors arranged to remain tightly closed when not necessarily open for cleaning.

(f). Only cement-mortar* or cement-lime-mortar* shall be used in setting flue linings.

(g). When two or more flues are contained in the same chimney, withes of brick or concrete* not less than three and three-quarter inches thick shall be provided at intervals not exceeding thirty inches horizontally. Where flue linings are not separated by withes, the joints shall be staggered.

4. Flues for low heat appliances.

(a). Smoke flues of stoves, cooking ranges, hot air, hot water and low pressure steam heating furnaces, and other low heat appliances other than gas appliances and incinerators elsewhere provided for, hereafter* constructed, shall be encased in approved-masonry* or reinforced-concrete* not less than eight inches thick; provided that for stone masonry other than sawed or dressed stone in courses, properly bonded and tied with metal anchors, the thickness shall be not less than twelve inches; and provided that in dwellings* for smoke flues in brick or solid concrete* chimneys, used exclusively for ordinary stoves, ranges, furnaces or open fireplaces, the thickness of the masonry may be reduced to not less than three and three-quarter inches.

NOTE.—For heat appliances classed as "low," see §1200.

(b). Every such flue shall be lined with a flue lining conforming to the requirements of this section.

*See definition, Section 200.

NOTE.—In no case should the substitution of a lining of parging mortar for clay flue linings be permitted. Experience has shown that such practice (formerly quite common) is not safe. The combined effect of wind, expansion and contraction due to temperature changes, and flue gases causes disintegration of such parging mortar linings.

5. **Flues for medium heat appliances.** Smoke flues of high pressure steam boilers, smoke houses and other medium heat appliances other than incinerators, hereafter* constructed, shall be encased in approved-masonry* or reinforced-concrete* not less than eight inches thick; provided that stone masonry shall be not less than twelve inches thick; and in addition, shall be lined with not less than four inches of fire brick laid in fire clay mortar, starting not less than two feet below the flue entrance and extending for a distance of at least twenty-five feet above the flue entrance.

NOTE.—For heat appliances classed as "medium" see §1200; for incinerator flues see subdivision 7 of this section and §1206.

6. **Flues for high heat appliances.** Smoke flues of cupolas, brass furnaces, porcelain baking kilns and other high heat appliances shall be built with double walls, each not less than eight inches in thickness, with an air space of not less than two inches between them. The inside of the interior walls shall be of fire brick not less than four inches in thickness.

NOTE.—For heat appliances classed as "high" see §1200.

7. **Flues for incinerators.**

(a). Flues hereafter* constructed for non-fuel fired incinerators in which the grate of the combustion chamber does not exceed nine square feet, shall be encased in clay or shale brickwork not less than three and three-quarter inches thick and a flue lining.

NOTE.—See also paragraph "f" of this subdivision, subdivision 2d of this section and §1206-2.

(b). Flues hereafter* constructed for non-fuel fired incinerators in which the grate of the combustion chamber exceeds nine square feet, shall be encased in clay or shale brickwork not less than three and three-quarter inches thick and a lining of fire brick not less than

*See definition, Section 200.

Section 1100

four and one-half inches thick for a distance of not less than thirty feet above the roof of the combustion chamber, and in clay or shale brickwork not less than eight inches thick beyond thirty feet above the roof of the combustion chamber.

NOTE.—See also paragraph “f” of this subdivision, subdivision 2d of this section and §1206-2.

(c). Flues hereafter* constructed for fuel fired incinerators in residence-buildings*, institutional-buildings*, churches, schools and restaurants, shall be encased as required for non-fuel fired incinerators with grates exceeding nine square feet, but the fire brick lining shall extend for not less than forty feet above the roof of the combustion chamber.

NOTE.—See preceding paragraph and §1206-3.

(d). Flues hereafter* constructed for rubbish and waste material incinerators shall be encased in clay or shale brickwork not less than eight inches thick and a lining of fire brick not less than four and one-half inches thick, laid in fire clay, for the full height of the flue.

NOTE.—The flues regulated by this paragraph do not include the combined flue and chute of garbage incinerators in residence buildings, institutional buildings, churches, schools and restaurants, which, as specified in §1206-2b, are to be constructed as flues for medium heat appliances as prescribed in subdivision 5 of this section.

See also §1206-3.

(e). Nothing in this section shall prohibit a fuel fired incinerator or a rubbish and waste material incinerator to connect to a boiler stack or flue for a high heat appliance by means of an approved* breeching provided the cross-sectional area of such stack or flue is at least four times that of the incinerator breeching.

(f). All flues for non-fuel fired incinerators shall terminate in substantial constructed spark arresters.

8. **Size of flues.** The cross-sectional areas of smoke flues shall be designed and proportioned to meet the conditions of temperatures, within and without the flue, thickness of masonry, exposure, shape and material of

*See definition, Section 200.

flue and other influences; but they shall be not less than seventy square inches for warm air, hot water and low pressure steam heating appliances; not less than forty square inches for ordinary stoves, ranges and room heaters; not less than twenty-eight square inches for small special stoves and heaters; not less than fifty square inches for fireplaces, but at least one-twelfth of the fireplace opening.

NOTE.—For the determination of the necessary sizes of flues for given conditions the "Code of Minimum Requirements for Heating and Ventilating of Buildings" of the American Society of Heating and Ventilating Engineers may be consulted.

9. Use of flues. It shall be unlawful to use as a smoke flue a flue hereafter* constructed or placed in a building*, or a flue now existing that is not already used as a smoke flue, unless it conforms to the requirements of this section.

10. Flues to be clean.

(a). Upon the completion of a building* or the alteration of existing flues, the flues shall be cleaned and left smooth on the inside.

NOTE.—It is important for safe and efficient operation of heat appliances that flues be maintained in a clean and unobstructed condition.

(b). The building-official* may require a test to be made to assure this condition before permitting the use of a flue.

NOTE.—No test should be made before the mortar used in the construction of the flue has thoroughly set. The method of test is to build a smudge fire at the bottom of the flue and while the smoke is flowing freely from the flue, close it tightly at the top. Escape of smoke into other flues or through the chimney walls indicates openings that must be made tight before the flue is accepted. The test should be made by the mason contractor in the presence of the building official and a representative of the owner.

11. Fireplaces.

(a). The back and sides of fireplaces hereafter* erected shall be of approved-masonry* or reinforced-concrete*, not less than eight inches in thickness. A lining

*See definition, Section 200.

Sections 1100—1101

of fire brick or other approved* material at least two inches thick shall be provided unless the thickness is twelve inches.

(b). Fireplaces, except when designed and used for approved* gas appliances only, shall have hearths of brick, stone, tile or other approved* incombustible material supported on masonry arches. Such hearths shall extend at least twenty inches outside of the chimney breast and not less than twelve inches beyond each side of the fireplace opening along the chimney breast. The combined thickness of hearth and supporting arch shall be not less than six inches at any point.

(c). Wooden centers used in the construction of that part of the supporting arch which is below the hearth of the fireplace inside of the chimney breast, shall be removed when the construction of the arch is completed and before plastering on the underside.

(d). No heater other than an electric heater or an approved* gas appliance shall be placed in a fireplace which does not conform to the requirements of this section and is not provided with a flue.

SECTION 1101. METAL SMOKESTACKS.

1. Construction.

(a). Metal smokestacks, unless structurally self-supporting, shall be guyed securely, or firmly anchored to or otherwise supported by the building* served thereby.

(b). All metal work shall be painted.

(c). Clean-out openings shall be provided at the base of every such stack.

(d). All such stacks hereafter* erected, outside or independent of a building*, shall be supported on substantial masonry foundations, so designed that the pressure on the soil shall not exceed two-thirds of the maximum allowable pressure on the soil.

*See definition, Section 200.

2. **Height.** All such stacks shall extend to a height of not less than ten feet above the highest point of any roof within twenty-five feet.

3. **Exterior stacks.**

(a). Every such stack, or part thereof, hereafter* erected on the exterior of a building* shall have a clearance from the wall of not less than twenty-four inches if the wall is of frame-construction*, and not less than four inches if it is of any other type of construction.

(b). No such stack shall be nearer than twenty-four inches in any direction from a wall opening, exit or fire escape.

(c). When such stack is insulated on the exterior in some approved* manner, the clearances herein prescribed may be reduced to two-thirds of those specified.

4. **Interior stacks.**

(a). Every such stack, or part thereof, hereafter* erected within a building* other than a one-story building*, shall be enclosed above the story* in which the appliance served thereby is located, in walls of approved-masonry* or fire-partitions*, with a space on all sides between the stack and the enclosing walls sufficient to render the entire stack accessible for examination and repair.

(b). The enclosing walls shall be without openings, except doorways equipped with approved* self-closing* fire doors at various floor levels for inspection purposes.

NOTE.—Re doors see Appendix B.

(c). Where such a stack passes through a roof constructed of combustible materials, it shall be guarded by a galvanized iron ventilating thimble extending not less than nine inches below and nine inches above such roof construction. Such thimbles shall be of a size to provide a clearance on all sides of the stack of not less than eighteen inches; provided that for stacks of low heat appliances the clearance may be reduced to not less than twelve inches.

NOTE.—For heat appliances classed as "low" see §1200.

*See definition, Section 200.

5. Prohibition. Smokestacks shall not be carried up inside of vent stacks or vent flues unless such stacks or flues are constructed as required by this article for smokestacks or smoke flues and such stacks or flues are used solely for venting the room or space in which the appliance served by the smokestack is located.

NOTE.—The importance of providing vents for gas-burning appliances is emphasized every year by numerous fatalities resulting from defective installation, faulty operation or accident. Gas appliances should be installed in strict accordance with the "Requirements for House Piping and Appliance Installation" of the American Gas Association.

SECTION 1102. CUPOLA CHIMNEYS.

Chimneys of cupola furnaces, blast furnaces and similar devices, hereafter* erected, shall extend at least twenty feet above the highest point of any roof within a radius of fifty feet thereof and be covered on the top with heavy wire netting or other approved* spark arrester. No woodwork or other combustible material or construction shall be erected or placed within three feet of any part of such device or its chimney.

SECTION 1103. RAISING ADJOINING CHIMNEYS.

1. When required. Whenever a building* is hereafter* erected, enlarged or raised so that a wall along a lot-line* or within three feet thereof, extends above the top of a chimney or smoke flue of a neighboring existing building* the owner* of the building* so erected, enlarged or raised, shall, at his own expense, carry up, either independently or in his own building* all chimneys and smoke flues of such adjoining building* within ten feet of any portion of the wall extending above such chimney or flue.

2. Construction. The construction of such chimneys and flues shall conform to the requirements of this article, but in no case shall the internal area of an extended flue be less than that of the existing flue.

*See definition, Section 200.

3. **Notice to owner.** It shall be the duty of the owner* of the building* to be erected, enlarged or raised to notify, in writing, at least ten days before such work is to begin, the owner* of the chimneys and flues affected, of his intention to carry up such chimneys and flues as herein provided. Such chimneys and flues shall be carried up simultaneously with the walls.

SECTION 1104. VENT FLUES.

Flues hereafter* erected or used for venting appliances that give off grease or grease-laden fumes shall be constructed and used entirely independent of other flues and shall conform to the requirements of this article for smoke flues.

SECTION 1105. GAS APPLIANCES.

1. **Flue connections.** Every gas appliance shall be connected to an effective flue or outlet pipe to the outer air, if it is included in any of the following classifications:

(a) Any appliance used for domestic purposes which has a demand in excess of 50,000 B.T.U. per hour, except in the case of the domestic gas range.

(b) Automatically controlled appliances which use more than 5,000 B.T.U. per hour. Automatically controlled appliances which use less than this amount shall be flue connected unless equipped with an effective device which, in the event that the constantly burning flame or pilot flame is extinguished, will automatically shut off the supply of gas to the main burner or burners.

(c) Appliances installed in the same room which have an aggregate demand at normal rating as great as 30 B.T.U. per hour per cubic foot of room content.

NOTE: For the conditions under which a gas appliance may be connected to a flue serving appliances using other fuel, see §1100-2c.

2. Flues or Outlet Pipes for Gas Appliances.

Type A. Lined chimneys or metal stacks, as provided for in Sections 1100 and 1101 are required for (1) all incinerators; and (2) all appliances, the normal operation

*See definition, Section 200.

Section 1105

of which at maximum input rating produce flue gas temperatures in excess of 550° F. at the outlet of the vent connection.

Type B. Outlet pipes of incombustible, non-corrodible material of sufficient thickness, cross-sectional area, and heat insulating quality to avoid temperatures in excess of 160° F., on adjacent combustible material, with bell and spigot or other acceptable joints. Where extending through from story to story to roof, located inside partitions or walls, or extending through walls to the outside shall have 1 inch clearance from all combustible materials.

Type C. Outlet pipes equal to soil pipe or standard steam or water pipe having acceptable joints and relatively low heat-insulating value. Where extending through from story to story to roof, located inside partitions or walls, or extending through walls to the outside shall be encased in an incombustible jacket with 1 inch air space, the encasing jacket or duct to be open at the top and bottom and to be continuous its entire length. Provided that for runs not exceeding 15 feet directly from the space in which the appliance is located, to the outer air, sheet metal pipe of corrosion resisting material equivalent to No. 24 gauge copper may be used; installation with reference to clearance from combustible material and passage through wall shall comply with the related provisions for smoke pipes.

Outlet pipes of Types B and C may, in general, be used with domestic appliances which have been tested when burning gas at a rate of 25 per cent. above the manufacturer's input rating and found to produce no temperature above 550° F. at the outlet of the vent connection.

NOTE: For further details for gas vents the National Board of Fire Underwriters Recommended Good Practice Requirements for the Installation, Maintenance and Use of Piping and Fittings for City Gas may be consulted.

3. Installation. Except as otherwise specifically provided in this ordinance or in rules duly promulgated by the building official*, gas appliances shall be installed in conformity with the above noted National Board of Fire Underwriters' Recommended Good Practice Requirements Governing Piping and Fittings for City Gas.

*See definition, Section 200.

ARTICLE XII

HEAT APPLIANCES AND FORCED DRAFT SYSTEMS

SECTION 1200. HEAT PRODUCING APPLI- ANCES.

For the purposes of this ordinance, heat producing appliances shall be classed as low, medium and high, as follows:

(a). Low heat appliances are those in which the temperatures developed at the furnace do not exceed six hundred degrees Fahrenheit, such as bake ovens, candy furnaces, coffee roasting ovens, cooking ranges, core ovens, cruller furnaces, hot air engine furnaces, hot air, hot water and small steam heating furnaces and boilers, japanning ovens, rendering furnaces, stereotype furnaces, wood drying furnaces.

(b). Medium heat appliances are those in which the temperatures developed at the furnace exceed six hundred degrees but do not exceed fifteen hundred degrees Fahrenheit, such as annealing furnaces (small) for glass or metal, charcoal furnaces, galvanizing furnaces, gas producers, smoke houses, steam boilers.

(c). High heat appliances are those in which the temperatures developed at the furnace exceed fifteen hundred degrees Fahrenheit, such as annealing furnaces, billet and bloom furnaces, blast furnaces, brass furnaces, cement, brick and tile kilns, coal and water gas retorts, cupolas, earthenware kilns, glass smelting furnaces, open hearth furnaces, porcelain baking and glazing kilns, welding furnaces.

NOTE.—In "Field Practice," an inspection manual issued by the National Fire Protection Association, a more extended list of appliances is given under the three types.

SECTION 1201. MOUNTING AND CLEARANCES.

1. General.

(a). Except as hereinafter otherwise provided, heat appliances shall be mounted on the ground, or on floors of fireproof-construction* or semifireproof-construction* with incombustible flooring or surface finish, or on trimmer arches supporting hearths as required in this ordinance for fireplaces, in all cases extending not less than twelve inches beyond such appliance on all sides.

NOTE.—Re hearths of fire-places see §1100-11b and c.

See also §1212-2 and 3 for clearances and mounting of oil-burning equipments.

(b). Except as hereinafter otherwise provided, the clear distance from combustible material, including plaster on combustible base, shall not be less than four feet above a low heat or medium heat appliance, nor less than fifteen feet above a high heat appliance; provided that when a low heat or medium heat appliance is encased in brick or in incombustible protective covering not less than one and one-half inches thick such distance may be three feet.

(c). Except as hereinafter otherwise provided, the clear distance from combustible material, including plaster on combustible base, shall be not less than three feet on the sides and rear of a low heat or medium heat appliance, nor less than ten feet on the side and rear of a high heat appliance; provided that when a low heat or medium heat appliance is encased in brick or in incombustible protective covering not less than one and one-half inches thick such distance may be two feet.

(d). The clear distances from combustible material including plaster on combustible base, shall be not less than four feet in front of a low heat appliance, not less than eight feet in front of a medium heat appliance, and not less than thirty feet in front of a high heat appliance.

*See definition, Section 200.

2. Stoves and ranges.

(a). Cooking stoves, laundry stoves, heating stoves, and combination coal and gas ranges hereafter* installed in dwellings* and in apartments* of multifamily-houses*, shall be set on hearths supported by masonry trimmer arches extending not less than six inches on all sides beyond such appliances; provided that such appliances with legs that provide an open air space of not less than four inches below the bottom of the appliance may be set on sheet metal or other approved* incombustible material.

NOTE.—Re hearths see §1100-11b and c.

(b). No such appliance shall be placed within twelve inches of a wooden stud partition, a wood-furred wall or combustible material, unless protected by a shield of metal or other approved* incombustible material so attached as to preserve an open air space behind it and to extend from the floor to one foot above and six inches beyond the sides of such appliance, in which case such appliance shall not be placed within six inches of a wooden stud partition, a wood-furred wall or combustible material.

(c). Domestic gas ranges in which the clearance between the base frame and the floor is two inches or less, shall be set on a base of hollow clay tile four inches thick or its equivalent, extending not less than two inches beyond the range on all sides; when such clearance is more than two inches but not more than six inches, such ranges shall be set on a base of asbestos board three-sixteenths of an inch thick held between two sheets of metal not less than No. 29 U. S. gage, extending not less than two inches beyond the range on all sides; when such clearance is more than six inches or the lower burners of the range are twelve inches or more, measured from the burner ports, above the floor, no protection shall be required; when such ranges are

*See definition, Section 200.

Section 1201

set so that the oven back or side of the cooking top is less than six inches from combustible material, the combustible material shall be protected by asbestos board three-sixteenths of an inch in thickness and sheet metal not less than No. 29 U. S. gage.

3. Heating furnaces.

(a). Hot air, hot water and steam heating furnaces hereafter* installed on wood-joisted floors or other combustible construction in dwellings*, shall have protective bases of sheet metal or asbestos covered with hollow masonry not less than four inches in thickness laid to preserve a free circulation of air through such masonry course. Such bases shall extend at least one foot beyond the furnace on all sides; provided that the extension at the front is at least two feet when solid fuel is used.

(b). No such appliance shall be located hereafter* nearer than eighteen inches in any direction to woodwork or other combustible material or construction, including plaster on combustible base.

4. Gas heating appliances.

Nothing in this ordinance shall prohibit the use of approved* portable gas or electric appliances when properly installed.

NOTE.—For appliances that may be accepted as approved under this paragraph, see "List of Inspected Gas, Oil and Miscellaneous Appliances" and "List of Inspected Electrical Appliances" of Underwriters' Laboratories, Inc.

5. Non-conforming installations. In case the installation of an existing heat appliance does not conform to the requirements of this section for appliances hereafter* installed, the building-official* may direct such changes in the location of the appliance or in the construction surrounding it as may be necessary to remove existing fire hazards.

*See definition, Section 200.

SECTION 1202. SMOKE PIPES.

1. **Connection with flue.** Except as otherwise provided in this ordinance, every smoke pipe shall connect with a smoke flue conforming to the provisions of this ordinance.

2. **Restriction.** No smoke pipe shall pass through a floor, nor through a roof unless such roof is of fire-proof-construction* or semifireproof-construction*.

3. **Protection to partitions.** Smoke pipes shall not pass through combustible partitions; provided that smoke pipes from ordinary ranges and stoves may do so if they are guarded by double metal ventilated thimbles six inches larger in diameter than the pipe, or by steel tubes built in brickwork or other approved* fireproofing materials extending not less than eight inches beyond all sides of the tube.

4. **Clearances.** The clear distance between a smoke pipe or metal breeching and combustible material or construction, including plaster on combustible base, shall be not less than eighteen inches in the case of low heat appliances, and not less than thirty-six inches for medium or high heat appliances; provided that such clearances may be reduced one-half when such smoke pipes or breechings are protected with not less than one inch of asbestos or in some other approved* manner or such combustible material or construction is protected by sheet metal or equivalent covering placed at least one inch from the surface to be protected and extending the full length of the smoke pipe and not less than twelve inches beyond it on both sides; and provided further that, in the case of smoke pipes used on ordinary heating or cooking stoves, such clearances may be nine inches but not less.

SECTION 1203. HOODS.

1. **When required.** Ranges, candy kettles, cruller furnaces, and appliances for the frying of bakery or

*See definition, Section 200.

Sections 1203—1204

confectionery products, except ranges in dwellings* or apartments* of multifamily-houses*, shall be provided with ventilating hoods and pipes to take off the smoke, gases and vapors; unless such appliances are enclosed and vented in an approved* manner.

2. **Location.** Such hoods shall not be raised more than six and one-half feet above the floor. The width and breadth shall be not less than that of the appliance served thereby.

3. **Construction.** Such hoods and their pipes shall be constructed of incombustible materials. The pipes shall be connected with independent masonry flues, constructed as required* for smoke flues for low heat appliances; provided that, in buildings* heretofore* erected when such masonry flues are not available, they may be connected with independent metal stacks outside the building; provided that, in either case, such flues or stacks shall be used for no other purposes.

NOTE.—For the construction of smoke flues for low heat appliances see §1100-4; for the construction of metal smoke stacks see §1101.

4. **Clearances.** Such hoods shall be installed to have the clearances required* for smoke pipes. Where the pipe passes through a partition, it shall be protected as required* for smoke pipes.

NOTE.—For clearances and protection of smoke pipes see §1202.

SECTION 1204. FORCED DRAFT SYSTEMS.

1. General.

(a). Blower and exhaust systems hereafter* installed as part of or attached to parts of a building* shall be constructed and installed to conform to the requirements of this section.

NOTE.—Additional details of installation and construction that should be observed will be found in "Regulations for the Installation of Blower and Exhaust Systems" of the National Board of Fire Underwriters.

(b). Blower and exhaust systems heretofore* in-

*See definition, Section 200.

stalled as part of or attached to parts of a building* shall not be altered, extended or enlarged, except in conformity with the requirements of this section.

(c). In the case of an existing blower or exhaust system that does not conform to the requirements of this section, the building-official* may direct such changes in location or construction as may be necessary to remove or abate fire hazards due to such non-conformance.

2. Ducts.

(a). Ducts of blower or exhaust systems shall be constructed of fire-resistive or non-combustible materials or they may be protected by means of fire-resistive materials in a manner approved* for the conditions and needs peculiar to a specific operation, process or industry. They shall be of ample strength and thickness to meet the conditions of the service for which they are used and the conditions under which they are installed.

(b). Ducts shall be tight throughout and no openings shall be permitted except those necessary to perform the required functions of the system.

(c). Ducts shall be thoroughly braced where required, and unless built within masonry work shall be substantially supported by metal hangers, brackets or their equivalent.

(d). There shall be a clearance of not less than one inch on all sides between metal ducts and combustible material or construction; and all combustible material or construction within six inches of such metal ducts shall be protected by incombustible material.

(e). Ducts shall not pass through firewalls* unless unavoidable. When ducts or the outlets from or inlets to same pass through firewalls* they shall be provided with approved* automatic* fire doors or shutters, on both sides of the wall.

(f). No room, hallway, attic, void, hollow or concealed space, nor other part of a building* shall be used as part of a blower or exhaust system unless it is an integral part thereof and used for no other purpose, and

*See definition, Section 200.

Section 1204

is constructed of or adequately protected by fire-resistive materials.

(g). Ducts shall conform to such other requirements hereinafter prescribed for specified systems.

3. Fans.

(a). Fans shall be installed on proper foundations or otherwise firmly secured to substantial supports, and constructed throughout of non-combustible materials.

(b). Housings of fans shall be of substantial construction, properly reinforced when required; and joints shall be air tight.

(c). Fans shall be so located and installed as to be readily accessible for repairing, cleaning, inspecting and lubricating.

(d). Fans shall not be located in firewalls*, or fire-partitions*.

(e). When flammable materials are to pass through fans the blades and spider shall be of bronze or similar composition or the casing shall consist of or be lined with such material. Ample clearance shall be provided between the blades and the casing. The bearings of the fans shall not extend into the housings or casings, nor into the ducts.

(f). Connections between discharge end of the fan and main duct shall be made in such a manner as to prevent leakage of fine dust.

(g). Exhausters, unless outside of the building, shall be located within the rooms or areas from which flammable vapors are being removed, or in compartments of fire-resistive construction within these rooms or areas.

4. Power transmission.

(a). Where power is transmitted to fans located within the rooms from which flammable vapors are being removed, from any driving mechanism or unit outside of same, the transmission shall be by means of shafts passing through close fitting shaft holes.

*See definition, Section 200.

(b). The transmission of power to fans located within rooms from which flammable dust is being removed shall be by means of shafts as required herein, or by means of belts, chains or similar driving mechanisms; provided the same are encased by means of dust-tight enclosures constructed of substantial non-combustible materials both on the inside and outside of the wall or partition pierced.

5. Grounding. All metal parts of apparatus, used in systems for the removal of flammable gases or vapors, or systems used for conveying combustible or flammable dust, stock or refuse, and shafting in connection therewith, shall be electrically grounded in an effective and approved* manner.

NOTE.—For safe and effective methods of grounding see National Electrical Code.

6. Vaults.

(a). Vaults for refuse from blower or exhaust systems shall be constructed with walls of brick or reinforced-concrete* and floors and roof of fireproof-construction*.

(b). Openings, if any, between vault and boiler room shall not exceed nine square feet in area, and the bottom of opening shall be not less than six inches above the level of boiler room floor. Openings shall be located at least eight feet from the firing door of boiler, at an angle of at least ninety degrees to it and shall be protected by approved* automatic* fire doors.

NOTE.—Re doors see Appendix B.

(c). When vaults are located inside of buildings* and do not extend above the roof, vent flues of non-combustible materials and protected as required* for ducts, shall be carried from the vaults to the outside of the building*.

NOTE.—For protection of ducts see subdivision 2 of this section.

(d). Vaults exceeding three hundred and sixty cubic feet shall be protected by automatic sprinklers or by other approved* fire extinguishing method.

*See definition, Section 200.

7. Heating, cooling and ventilating systems.

(a). In heating, cooling or ventilating systems, except in recirculating systems as hereinafter provided, intakes of air shall be from the outside and shall be taken only from areas containing no combustible materials. Intakes shall be protected by suitable metal screens and substantial automatic* shutters or doors.

(b). In airplane hangars, garages* and similar occupancies central furnace fan plants of the recirculating type shall be so designed and installed that not less than five per cent. of the air moved by the fan shall be taken direct from outside of the building* through a duct which shall deliver the outside air to a point near the floor on which the fan rests. The duct shall be open at all times and the air supply which it supplies shall be without control. Except as herein provided recirculating systems shall be installed to prevent flammable vapors, flyings or dust entering the intake. The provisions of this paragraph shall not be construed as applying to unit heaters; provided that unit heaters, regardless of type, shall, when installed in buildings* of such occupancy, be located not less than eight feet above the floor.

(c). Except in the case of unit heaters, intakes, intake rooms, steam coils, blowers and other appliances of the system, shall be separated from other parts of the building* by walls or partitions, floors and ceilings, having a fire-resistive rating of not less than one hour. Openings in the walls or partitions shall be equipped with approved* doors.

NOTE.—For acceptable forms of one-hour partitions see §1003-4; re doors see Appendix B.

(d). Outlets on supply and exhaust ducts shall be provided with registers, register faces or substantial screens of wire or expanded metal of not more than one inch mesh.

(e). When vertical ducts serve more than one story*, substantial approved* automatic* dampers shall be provided on all outlet openings directly from such vertical ducts and at all connections at branch ducts from

*See definition, Section 200.

such vertical ducts. Bearings of such dampers shall be of non-corrodible material.

8. Removal of flammable vapors.

(a). In blower or exhaust systems for the removal of flammable vapors ducts shall lead to the outside of the building in the most direct manner possible without passing through other rooms than the one to be served. They shall not be built in walls, other than to pass directly through them.

(b). Outlets of ducts shall be kept clear of and away from combustible materials, and shall be protected and guarded against exposure by reliable fire screens.

(c). Inlets, whether near the floor or near the ceiling, shall be flared or funnel shaped. Those at or near the floor shall be protected by substantial wire screens of not more than one-half inch mesh.

(d). Dampers, valves or shutters shall not be placed within the ducts or at the inlets or outlets of the ducts.

(e). Ducts shall be free from pockets or traps.

(f). When hoods are used for the removal of flammable vapors from special points or apparatus, they shall be constructed of non-combustible materials throughout. The connections between the hoods and the ventilating ducts shall be at the highest points of the hoods, and be of a size not less than that of the connecting ducts with reducing connections to the ducts.

9. Dust, stock and refuse conveyors.

(a). In blower or exhaust systems for conveying dust, stock or refuse, suitable tight-fitting sliding clean-out doors shall be provided on all conveyor ducts at sufficient intervals to facilitate cleaning of ducts or removing obstructions.

(b). Cyclone collectors or separators and their supports shall be constructed of incombustible materials. They shall, unless unavoidable, be located outside the building. They shall not be placed within ten feet of combustible construction or unprotected openings, unless they are provided with metal vent pipes extending to a point above the highest part of any roof within thirty feet.

Section 1204

(c). Discharge pipes from cyclone collectors or separators shall have clearances as prescribed in this section for ducts.

NOTE.—For required clearances see subdivision 2 of this section.

(d). No delivery pipes from cyclone collectors shall convey refuse directly into fire boxes of boilers, furnaces, including Dutch ovens, refuse burners, incinerators, or other appliances, which utilize induced or forced draft. In no case shall the vent outlets of the cyclone be higher than the top of the stack of such appliances.

(e). The discharge ends of delivery pipes from cyclone collectors shall be kept as far as possible from the grates. They shall be so arranged that they can be withdrawn from the furnace when not in use and deliver the refuse to some point as remote from the furnace as possible. Suitable shut-off valves or dampers which will not interfere with the delivery of the refuse, shall be provided.

(f). Exhaust systems for conveying refuse or stock shall be vented to the outside of the building, either directly or by means of flues, by way of the separators, or by way of the bins or vaults into which they discharge. Such vents shall be as direct as possible and of ample size. In no case shall they be vented into chimneys, pipes, vents or flues used for other purposes.

(g). In air vents which carry explosive or combustible dust, air washers or suitable filters for eliminating such dust shall be provided.

(h). Metal screens or equally efficient means shall be provided at the outlets of open air vents to prevent the entry of sparks. When used at safety relief vents, they shall not be secured.

(i). Safety relief vents or explosion vents, of ample size shall be provided on all systems used for conveying explosive or combustible refuse or stock. When taken off pipes or flues they shall be of at least the same cross-sectional area as the pipe or flue vented, and must be taken off ahead of the turns or at their peak. They shall lead by the most direct practicable route to the outside of the building, and in as nearly vertical a direction

as possible. They shall not deviate more than twenty-two and one-half degrees from the direction of the duct from which they lead. Horizontal runs shall not be used nor shall they lead through adjoining buildings.

(j). Safety relief vent outlets shall be provided with cowls or hoods, or, when non-escape of materials is essential, with counterbalanced relief valves or covers, provided with soft felt gaskets at least three-quarters of an inch thick.

SECTION 1205. DRYING ROOMS.

Drying rooms or dry kilns hereafter* placed within a building* shall be constructed entirely of incombustible materials. When the heating pipes are not placed overhead, they shall be so shielded as to preserve at all times a clear space of not less than two inches between them and the contents.

SECTION 1206. INCINERATORS.

1. **General.** Incinerators constructed as an integral part of a building*, for the reduction of garbage, refuse or other waste materials, shall be installed in accordance with the provisions of this section.

NOTE.—Additional provisions that should be observed will be found in "Regulations for the Construction of Incinerators" of the National Board of Fire Underwriters.

2. Non-fuel fired incinerators.

(a). Incinerators in which no fuel, except a gas flame or similar means to accomplish ignition, is used for combustion, other than normal refuse, and in which the chute and smoke flue are identical, hereafter* installed in residence-buildings*, institutional-buildings*, churches, schools and restaurants, shall have the enclosing walls of the combustion chamber constructed of clay or shale brickwork not less than three and three-quarter inches thick when there is a horizontal grate area of not more than nine square feet and not less than eight inches thick when there is a horizontal grate area exceeding nine square feet, and, in each case, a lin-

*See definition, Section 200.

Section 1206

ing of fire brick not less than four and one-half inches thick, with an air space, in the case of the thicker wall, between the clay or shale brick and the fire brick sufficient to provide for expansion and contraction.

(b). The combined chute and flue shall be constructed as prescribed in this ordinance for flues for incinerators. Such chute and flue shall be constructed straight and plumb, and finished smooth on the inside.

NOTE.—See §1100-7.

(c). Service openings into the chute shall be equipped with approved* self-closing* hoppers so constructed that the chute or flue is closed off while the hopper is being charged and that no part will project into the chute or flue. The area of the service opening shall not exceed one-third of the area of the chute or flue.

3. Fuel fired incinerators.

(a). Fuel fired incinerators, whether the fuel is specially supplied or consists of refuse or waste material, shall have the enclosing walls of the combustion chamber constructed of clay or shale brick not less than eight inches thick and a lining of fire brick not less than four and one-half inches thick when the grate area does not exceed nine square feet, nor less than nine inches thick when the grate area exceeds nine square feet, all strongly braced and stayed with structural steel shapes; provided that the outer four inches of clay or shale brickwork may be replaced by a steel plate casing three-sixteenths of an inch in thickness; and provided that the fire brick lining is laid in fire clay mortar.

(b). The combustion chamber shall be located in a separate room or compartment used for no other purpose, or in a room devoted exclusively to boilers and heating plant. In either case such room shall be separated from the rest of the building by floors and ceilings of fireproof-construction* or semifireproof-construction* and firewalls* or fire-partitions* in which all openings are equipped with approved* fire doors.

NOTE.—Re doors see Appendix B.

*See definition, Section 200.

(c). The flue connections or breechings from the combustion chamber shall be constructed of No. 16 U. S. gage metal when they do not exceed twelve inches in diameter or greatest dimension and of No. 12 U. S. gage metal when they exceed twelve inches in diameter or greatest dimension. In addition they shall be lined with fire brick, laid in fire clay mortar, not less than two and one-half inches thick when they exceed twelve inches but do not exceed eighteen inches in diameter or greatest dimension, and not less than four and one-half inches thick when they are larger. If they lead into and combine with flue connections or breechings from other appliances, such other connections or breechings shall also be lined as required* for direct flue connections, unless the cross-sectional area of the connection into which they lead is at least four times their required cross-sectional area.

(d). The clearance to woodwork or other combustible material or construction, on all sides of flue connections or breechings from the combustion chamber, shall be not less than thirty-six inches; provided that when such woodwork or combustible construction is guarded by a metal shield backed with asbestos three-sixteenths of an inch thick, such clearance may be reduced to eighteen inches.

(e). Refuse chutes, except when used exclusively for garbage disposal in residence-buildings*, institutional-buildings*, churches, schools and restaurants, shall not feed directly to the combustion chamber, but shall discharge into a room or bin enclosed and separated from the incinerator room, by floors, ceilings and walls of equal fire-resistance to those required to enclose the incinerator room. The opening through which material is transferred from such room or bin to the incinerator room shall be equipped with an approved* fire door.

NOTE.—Re doors see Appendix B.

(f). Refuse chutes shall rest on substantial incombustible foundations. The enclosing walls of such chutes shall consist of clay or shale brickwork not less than

*See definition, Section 200.

Sections 1206—1207—1208

eight inches thick or of reinforced-concrete* not less than six inches thick. Such chutes shall extend to and not less than four feet above the roof and shall be covered by a metal skylight glazed with thin plain glass.

(g). Service openings for chutes shall be located in separate rooms or compartments enclosed in walls or partitions, floors and ceilings, having a fire-resistance rating of not less than one hour. Such openings shall be equipped with approved* fire doors or other approved* devices.

NOTE.—Re doors or other devices see Appendix B.

SECTION 1207. ASH PITS.

Ash pits or receptacles for ashes shall be of iron, brick or other incombustible material. The walls of ash pits shall be of approved-masonry* not less than eight inches thick. The floor and, in case such ash pit is covered, the roof shall be of fireproof-construction*; provided that when such pit is not covered the ceiling of the room in which it is located shall be of fireproof-construction*.

SECTION 1208. WARM AIR PIPES.

1. **Material.** Warm air pipes, fittings and connections in warm air heating systems shall be made of bright tin not lighter than IC, or of galvanized iron; provided that pipes twelve inches or more in diameter shall not be made of material lighter than IX tin or No. 26 U. S. galvanized iron.

NOTE.—Further details of installation and construction and methods of determining sizes of warm air pipes will be found in the "Standard Code Regulating the Installation of Gravity Warm Air Heating Systems in Residences" issued by the National Warm Air Heating and Ventilating Association in cooperation with other kindred organizations.

2. Protection.

(a). Warm air pipes leading from the furnace to vertical or wall stacks shall not be placed nearer than one inch to woodwork unless such woodwork is covered

*See definition, Section 200.

with asbestos paper and the paper covered with tin or iron.

(b). Wall stacks or wall pipes shall be covered with not less than one thickness of asbestos paper weighing not less than twelve pounds per hundred square feet. An air space of not less than five-sixteenths of an inch shall be provided on all sides;

(c). Or, such wall stacks or wall pipes, together with heads, boots, ells, tees, angles and other connections shall be made double, from the boot to the top of such stack and to the register head in each story. There shall be a continuous uniform air space of not less than five-sixteenths of an inch between the outer and inner walls.

(d). No warm air pipe shall be placed in a floor, partition or enclosure of combustible construction, unless it is at least six feet distant in a horizontal direction from the furnace.

3. Construction.

(a). In pipes leading from the furnace all joints shall be either double seamed or lapped not less than one and one-quarter inches and such joints shall be match beaded, or beaded and soldered, or riveted. The side seams of such pipes shall be locked seams.

(b). No wall pipes or fittings which depend wholly on soldered joints shall be used.

(c). The various members of wall pipes shall be so made that all joints are locked or soldered and the several members shall be attached to each other with air-tight slip joints.

(d). All pipes leading from the furnace and their fittings shall be properly and securely supported from ceiling or joists.

(e). All vertical stacks or wall pipes must be secured firmly in place by lugs or straps attached to the outer wall of stacks and fittings. No nails shall be driven through stacks or pipes or fittings at any point. No lugs

or straps shall be formed by cutting holes in outer wall of stacks, pipes or fittings.

4. **Cold air ducts.** The cold air ducts of heating systems within six feet of their connection with the furnace, shall be of metal or approved* incombustible material.

SECTION 1209. REGISTERS.

1. **Setting.** Registers used in heating systems, placed in woodwork or in combustible floors, shall be surrounded with a border of incombustible material not less than two inches wide, securely set in place or in some other approved* manner.

2. **Construction.** Register boxes shall be made of sheet metal. They shall be double with not less than one-inch air space between the two, or, they may be single, covered with asbestos not less than one-eighth inch thick, provided that any woodwork within two inches is covered with tin.

3. **Register over furnace.** When a register box is placed in the floor over a furnace, the space on all sides between the casing and the register box shall be not less than four inches.

4. **Fixed register required.** Every hot air furnace shall have at least one register without valve or louvres.

SECTION 1210. STEAM AND HOT WATER PIPES.

1. Protection.

(a). Where steam or hot water heating pipes pass through combustible floors, or partitions, or other combustible construction there shall be an open space of not less than one inch on all sides of the pipe, which shall be capped at the ends with incombustible material.

NOTE.—When waterproof floors are provided, metal sleeves should be provided, fitting closely to the perimeter of the open-

*See definition, Section 200.

ing and carried at least six inches above the finished floor surface with the caps at the top of the sleeve, so as to prevent water flowing through the openings to the floor below.

(b). Such pipes passing through stock shelving shall be covered with not less than one inch of approved* insulation.

(c). Wooden boxes or casings enclosing steam or hot water heating pipes, or wooden covers to recesses in walls in which such pipes are placed, shall be lined with metal.

2. **Pipe coverings.** Coverings or insulation used on steam or hot water pipes shall be of incombustible material.

3. **Passage through floors.** Where such pipes or plumbing pipes pass through floors or partitions of fire-proof-construction* or semifireproof-construction*, the openings around them shall be sealed tight with incombustible material to prevent the passage of fire.

SECTION 1211. BOILER ROOMS.

Every steam boiler carrying more than fifteen pounds per square inch pressure, hereafter* installed in a building* other than an industrial building, shall be located in a separate room or compartment and separated from the rest of the building* by a firewall* or fire-partition*, and by a floor and a ceiling of fireproof-construction*.

SECTION 1212. OIL BURNING EQUIPMENTS.

The mounting of furnaces connected with oil burning equipments, the clearances between such furnaces and smoke pipes connected thereto and woodwork or other combustible material shall be in compliance with the re-

*See definition, Section 200.

lated provisions of Sections 1201 and 1202 which are general requirements applying to all types of fuel installations. For other provisions regulating the installation and use of oil-burning equipments see "Regulations for the Installation of Oil-Burning Equipments" of the National Board of Fire Underwriters.

ARTICLE XIII
THEATRES AND OTHER SPECIAL
OCCUPANCIES

SECTION 1300. SEATINGS.

1. General.

(a). In places of assembly in which seating is provided, except in churches and other places for religious assembly, stadiums and reviewing stands, individual seats shall be provided for the persons congregating therein.

(b). The width of seat allotted for each person shall be not less than twenty inches.

(c). Seats, whether fixed or movable, shall, except in boxes or loges not exceeding sixty square feet in area, be arranged in rows set not less than thirty-two inches apart from back to back measured in a horizontal direction.

(d). When individual fixed seats are provided or required* no seat shall have more than six seats intervening between it and an aisle; provided that if the seatings are fixed chairs with self-raising seats so spaced that when the seats are raised there is an unobstructed space of not less than twenty-two inches, minimum hori-

*See definition, Section 200.

zontal projection between the rows of seats, and doorways leading directly to exit corridors are provided not more than five feet apart along the sides of the auditorium, the number of seats in a row shall not be limited.

(e). In places of assembly used regularly for theatrical, operatic or similar performances, or for the display of motion pictures, the seats, except in boxes or loges not exceeding sixty feet in area, shall be fixed and shall be separated by arms.

(f). In boxes or loges not exceeding sixty square feet in area, and in other locations where loose chairs are permitted, not more than one chair shall be provided for each six square feet of floor space.

2. Aisles.

(a). Every aisle shall lead to an exit door, or to a cross aisle, that is, an aisle running parallel with the seat rows and leading to an exit door.

(b). The width of an aisle running at right angles to the seat rows, in places of assembly in which seating is provided, shall be not less than thirty-six inches plus one-quarter inch for every foot of length of such aisle, from its beginning to an exit door or to a cross aisle, or between cross aisles. Cross aisles shall be not less in width than the widest aisle with which they connect.

(c). Steps shall not be placed in aisles unless the gradient would exceed one foot rise in ten feet run. Steps, when necessary, shall be grouped, and so far as practicable isolated steps shall be avoided. Such steps shall extend across the full width of the aisles and shall be illuminated; treads and risers shall conform to the requirements of this ordinance for exit stairs.

NOTE.—For the proper proportioning of treads and risers see §604-6.

(d). Aisles shall be used only for passage to and from seats and shall be kept unobstructed at all times.

3. Galleries. In galleries or other locations where seatings are arranged on platforms or successive tiers, and the height of the rise from one platform to another below and in front of it exceeds twenty-one inches, a

substantial railing not less than thirty inches high shall be placed at the edge of the platform along the entire row of seats.

4. **Grand stands.** For unenclosed places of assembly such as grand stands, stadiums and reviewing stands, fixed seatings between aisles shall not be limited but the required* widths of the aisles shall be increased one-eighth of an inch for each additional seat in any one row, above the minimum number fixed in this section for other places of assembly.

SECTION 1301. STAGE.

1. General.

(a). No stage for theatrical or similar performances, including drama, opera, vaudeville and the like, which requires or uses a curtain, portable or fixed scenery, lights, mechanical appliances, or any of them, shall be erected, placed or maintained hereafter* in a building* except in conformity with the provisions of this section.

NOTE.—For requirements relating to sprinkler protection see §1702-1e.

(b). Every such stage now existing, if reconstructed or altered, shall be made to conform with the provisions of this section.

2. Enclosure walls.

(a). Such stage shall be enclosed on all sides, except for the proscenium opening and the necessary doors and windows, with solid walls of approved-masonry*, extending from the foundation to and at least four feet above the roof of the building*. That part of such enclosure walls that separates the stage and auditorium, known as the proscenium wall, shall have a fire-resistance rating of not less than four hours.

(b). There shall be no window opening in such enclosure wall within five feet of a lot-line* other than a street-line*.

3. **Proscenium wall.** In that portion of the enclosure walls which separates the stage from the audito-

*See definition, Section 200.

rium, there shall be no other openings than the proscenium opening and one doorway at the stage floor level and one doorway from the space below the stage floor to the musicians' pit, if there is one.

4. Appurtenant rooms.

(a). Dressing rooms, scene docks, property rooms and other rooms or compartments appurtenant to the stage shall be separated from the stage and other parts of the building* by walls of approved-masonry*.

(b). Such rooms may be placed within the stage enclosure walls, provided they are separated from the rest of the stage by walls or partitions, floors and roofs of fireproof-construction*.

(c). In no case shall openings other than the necessary doorways at the stage level, connect such rooms with the rest of the stage.

(d). No such room shall be placed over or under the stage.

5. Dressing rooms.

(a). Dressing rooms shall have an independent exit leading directly into a court* or street*.

(b). Unless they are ventilated by windows to a court* in conformity with the requirements of this ordinance for workrooms, they shall be ventilated by a mechanical air conditioning and ventilating system providing not less than ten changes of air per hour.

NOTE.—For required ventilation to the outer air, of workrooms see §501-2.

6. Curtain.

(a). The proscenium opening shall be provided with a fireproof metal curtain, or, when the opening does not exceed twenty-eight feet in width nor twenty-two feet in height in places of assembly accommodating less than one thousand persons, with a reinforced asbestos curtain, sliding at its sides in iron grooves securely fastened to the proscenium wall, and extending not less than eigh-

*See definition, Section 200.

Section 1301

teen inches beyond each side of the opening into such grooves.

NOTE.—The curtain should be carefully constructed and installed. Details of construction will be found in Appendix P.

(b). The proscenium curtain shall be so arranged and maintained that, in case of fire, it will be released automatically and instantly by an approved* heat-actuated device, and will descend safely and close completely the proscenium opening. It shall also be equipped with effective devices to permit prompt and immediate closing of the proscenium opening by manual means.

(c). No part of such curtain shall be supported or fastened to combustible material.

(d). Such curtain shall be so designed and constructed that it will prevent all passage of flame for at least thirty minutes and will withstand without failure a temperature of not less than seventeen hundred degrees Fahrenheit and an air pressure of not less than ten pounds per square foot normal to its surface, during such period. The building-official* may require a fire test or other satisfactory evidence of its efficiency in this respect.

NOTE.—See Appendix P.

7. Construction.

(a). All that portion of the stage not comprised in the working of scenery, traps and other mechanical apparatus for the presentation of a scene, approximately equal to the width of the proscenium opening, and all appurtenant rooms and compartments shall be of fireproof-construction*.

(b). The fly galleries entire, including pin-rails, shall be constructed of iron or steel, and the floors of said galleries shall be of fireproof-construction*.

(c). The rigging loft shall be of incombustible material.

(d). The roof over the stage shall be of fireproof-construction*.

*See definition, Section 200.

8. Doors and windows.

(a). Door openings leading from the stage directly to the outer air shall be equipped with approved* self-closing fire doors. Door openings in the proscenium wall shall be equipped with approved* automatic* fire doors on one side of the wall and with approved* self-closing* fire doors on the other. All other door openings connecting with the stage shall be equipped with approved* automatic* fire doors.

NOTE.—Re doors see Appendix B.

(b). Windows shall be approved* fire windows.

NOTE.—Re windows see Appendix B.

9. Ventilators.

(a). Over the stage there shall be provided one or more ventilators of metal or other incombustible material, equipped with movable shutters or sash, having an aggregate clear area of not less than one-eighth the area of the stage, constructed to open automatically and instantly by approved* heat-actuated devices. Suitable means for manual operation shall be provided in addition.

NOTE.—Effective and reliable ventilators over stages described in subdivision 1a of this section, are of extreme importance as safeguards to life and property. The necessity for them is nowise lessened because a stage is only occasionally used, as would be the case in schools, hotels or club houses.

(b). If glass is used in the construction, only wired glass shall be used in such parts where the breaking of glass would cause it to fall on the stage.

10. Shelving. All shelving and closets in dressing rooms, property rooms or storage rooms, shall be constructed of metal, slate or other incombustible material.

11. Lights.

(a). The troughs or frames for footlights and border lights shall be of incombustible materials.

(b). The suspension lines of border lights shall be of wire for at least ten feet from the frames.

*See definition, Section 200.

Sections 1301—1302—1303

12. Electrical equipment.

(a). The switchboard for the electrical equipment of such stage shall be so located that it will be accessible at all times, and will be protected from falling objects and from the storage or placing of stage equipment against it.

(b). All electric equipment of the stage shall conform to the provisions of this ordinance and the authorized rules relating to electrical control.

NOTE.—See Article 16 on “Electrical Control.”

SECTION 1302. USE OF ROOFS.

1. For assembly. It shall be unlawful to use or permit the use of the roof of a building* or structure* as a place of assembly unless it has been designed for that purpose and provided with adequate exits.

NOTE.—This provision includes a prohibition of the use of roofs for the erection of temporary reviewing stands sometimes erected for the viewing of parades or other functions.

For proper exit facilities, see §602-5; §603; §604; §611.

2. For household purposes. No roof of a building* shall be used for hanging out clothing or for drying wash, or for other household purposes unless there shall be provided substantial guard rails, fences, parapets or other safeguards along the edges of such roof or that part of it which is restricted to the uses herein specified.

SECTION 1303. PLACES OF ENTERTAINMENT COMBINED WITH OTHER OCCUPANCIES.

No theatre or other place of public entertainment shall be hereafter* located within or attached to a building* of other than fireproof-construction* or semi-fireproof-construction*, unless it is completely separated by walls and floors of fireproof-construction*. No theatre or other place of public entertainment shall be hereafter* located within or attached to a building* occu-

*See definition, Section 200.

pied* as a dwelling*, multifamily-house*, factory* or storage-building*, unless it is completely separated by walls and floors of fireproof-construction* having a fire-resistance rating of not less than four hours.

SECTION 1304. GARAGES COMBINED WITH OTHER OCCUPANCIES.

1. Public garage.

(a). No public-garage* shall be hereafter* located within or attached to a building* occupied* for any other purpose, unless it is separated from such other occupancy, and the walls, floors and ceilings enclosing it are of fireproof-construction* or semifireproof-construction*.

(b). Walls, floors and ceilings which effect such separation shall be continuous and unpierced by openings of any kind; provided that door openings equipped with self-closing* fire doors leading to salesrooms or offices that are operated in connection with such garages* shall not be prohibited; and provided also that the use of elevators* and stairways* to other stories* accessible only by vestibules or balconies constructed and arranged as required* for fire towers, shall not be prohibited; and provided further that when such garage is connected with a residence-building*, no business or industry connected directly or indirectly with motor vehicles shall be conducted therein.

NOTE.—Re fire doors see Appendix B. For access to fire towers see §604.

2. Private garage.

(a). No private-garage* shall be hereafter* located within or attached to a building* occupied* for any other purpose, unless it is separated from such other occupancy, and the walls, partitions and floors enclosing it have a fire-resistance rating of not less than one hour.

(b). Walls and partitions which effect such separation, and all floors and ceilings shall be continuous and unpierced by openings; provided that in dwellings* a door opening equipped with a self-closing* fire door and

*See definition, Section 200.

having its sill raised not less than one foot above the garage floor, shall not be prohibited.

NOTE.—Re fire door see Appendix B.

SECTION 1305. STABLES AND BARNs.

Every building* occupied* as a stable or barn for the housing or keeping of two or more horses or other animals shall be provided with impervious floors properly drained to the public sewers.

ARTICLE XIV

ELEVATORS

SECTION 1400. GENERAL.

1. Installation.

(a). Elevators* and amusement-devices*, hereafter* erected or installed, or hereafter* altered shall be constructed, installed and maintained in accordance with the provisions of this article and with rules duly promulgated by the building-official*, or, in the absence of such rules, with generally accepted good practice.

(b). Except as otherwise specifically provided in this ordinance or in rules duly promulgated by the building-official*, "The American Standard Safety Code for Elevators, Dumbwaiters and Escalators", approved by the American Standards Association, shall be deemed to be the generally accepted good practice for the construction, installation, maintenance and operation of elevators*.

2. Dumbwaiters excepted. The provisions of this article shall not apply to ordinary dumbwaiters and similar apparatus operated by hand power, which are of such size, arrangement or construction that they cannot be used for the accommodation of persons. Such apparatus shall, however, conform to rules that may be promulgated by the building-official* to provide for their safe construction and installation.

*See definition, Section 200.

SECTION 1401. REPAIRS.

Repairs or changes to elevators* and amusement-devices* which involve the type of elevator* or its motive power, or the safety devices or operating mechanism shall not be made until notice has been given to the building-official*.

NOTE.—See also §1406-2.

SECTION 1402. DESIGN AND EQUIPMENT.

1. Carrying capacity.

(a). Elevators* hereafter* installed or altered shall be designed to sustain safely in all parts the load to be carried. Such loads per square foot of car platform area shall in no case be less than seventy-five pounds for power driven passenger-elevators*; fifty pounds for hand power passenger-elevators*; and fifty pounds for power driven freight-elevators* having platform areas not exceeding one hundred square feet.

(b). The safe carrying capacity of every elevator* shall be conspicuously posted in or on the car or platform.

2. Car safety devices. Every elevator*, except side-walk elevators having a rise of not more than fifteen feet, shall be equipped with safety devices for bringing the car or platform to rest without serious injury to persons riding thereon whenever its speed becomes excessive.

3. Car and door interlocks. Every elevator* hereafter* installed or altered shall be equipped with a device that will automatically prevent the car or platform from being moved while the shaft door at which the car or platform is standing is unlocked.

NOTE.—Between eighty-five and ninety per cent of elevator accidents in past years were due to unprotected doors to the shafts. Compliance with the provision for interlocks will undoubtedly prevent these accidents.

4. Limit devices. Every elevator* hereafter* installed or altered shall be equipped with efficient limit

*See definition, Section 200.

Sections 1402—1403—1404—1405

devices that will prevent the car or platform moving beyond its line of travel at either end.

5. Emergency exit.

(a). Every passenger-elevator* car shall be provided with a trap door in the top of adequate size to provide easy egress for passengers in case of accident.

(b). When there is more than one car in a shaft*, additional emergency exits consisting of doors in the sides of the cars so located that access may be had to an adjacent car, shall be provided.

6. Lighting. All elevator cars or platforms shall be properly lighted when in service.

7. Freight compartment. No elevator car shall have attached above, below or on any side a freight compartment or similar device.

SECTION 1403. RIDING ON FREIGHT ELEVATORS RESTRICTED.

It shall be unlawful for any person, other than the operator or those necessary to handle freight to ride on a freight-elevator*. Every freight-elevator* shall have a notice posted conspicuously thereon as follows: THIS IS NOT A PASSENGER ELEVATOR. ANY PERSON OTHER THAN THE OPERATOR, RIDING ON THIS ELEVATOR DOES SO AT HIS OWN RISK.

SECTION 1404. AMUSEMENT DEVICES.

Amusement-devices* shall be equipped with safety clutches. The cars or receptacles which persons are permitted to occupy shall have handrails of sufficient number and height or other approved* appliances or safeguards, to prevent persons from being thrown therefrom or coming in contact with structural members.

SECTION 1405. CERTIFICATE.

1. Required in all cases. It shall be unlawful for the owner* to operate or permit the operation or use of

*See definition, Section 200.

a passenger-elevator*, freight-elevator* or amusement-device* hereafter* installed or constructed, until a certificate shall have been obtained from the building-official*.

2. **Issuance.** The building-official* shall, within a reasonable time after being requested to do so, inspect and test or cause to be inspected and tested every elevator* or amusement-device* hereafter* installed or constructed, or hereafter* altered, and if the same is found to be safe and in conformity with the provisions of this article and the rules, shall issue a certificate to that effect.

3. **Temporary permission to use.** Nothing herein contained shall prevent the temporary use by special permission of the building-official* of an elevator* during construction; provided a notice is conspicuously posted on or in connection with such elevator* to the effect that such elevator* has not been officially approved*.

SECTION 1406. INSPECTION.

1. When required.

(a). The building-official* shall make or cause to be made an inspection of every passenger-elevator* at least once in every three months, and of every freight-elevator* and every amusement-device* at least once in every six months.

NOTE.—See note under §101-4. There are few cases when elevators are not insured against accidents by casualty companies. Municipal authorities might well take advantage of inspections made by such agencies with incidental economy to the municipality.

(b). At least once a year the inspection shall include a safety test.

(c). Seasonal amusement-devices* which have been out of use for a period exceeding thirty days shall not be operated again until reinspected by the building-official*.

2. Notice of repairs.

(a). Upon notice from the building-official* repairs

*See definition, Section 200.

found necessary to such an elevator* or amusement-device* shall be made without delay by the owner* or person* in control of such elevator* or amusement-device*.

(b). In case defects exist which make the continued use of such elevator* or amusement-device* dangerous to life or limb, the use of such elevator* or amusement-device* shall cease; and it shall not be used again until a reinspection has been made after necessary repairs and a new certificate has been issued.

3. **Certification.** After every inspection which shows an elevator* or amusement-device* to be safe and in conformity with the requirements of this ordinance, the building-official* shall issue a certificate to that effect.

SECTION 1407. ACCIDENTS.

1. **To be reported.** The owner* or person* in control of an elevator* or amusement-device* shall immediately notify the building-official* of each accident to a person or apparatus on, about or in connection with such elevator* or amusement-device*, and shall afford him every facility for investigating such accident and the damage resulting therefrom.

2. **Investigation.** The building-official* shall make or cause to be made an investigation and shall place on file in his office a full report of such investigation. Such report shall give in detail all material facts and information available and the cause or causes so far as they can be determined, and shall be open to public inspection at all reasonable hours.

3. **Operation discontinued.** When an accident involves the failure or destruction of a part of the construction or of the operating mechanism, the elevator* or amusement-device* shall not be used again until it has been made safe. The building-official* may, if deemed necessary, order the discontinuance of the ele-

*See definition, Section 200.

vator* or amusement-device* until a new certificate has been issued.

4. Removal of parts restricted. No part of the damaged construction or operating mechanism shall be removed from the premises until permission has been granted by the building-official*

SECTION 1408. OPERATION.

Every passenger-elevator*, except automatic elevators* and escalators, and every amusement-device* shall be in charge of a competent, reliable operator, with previous experience or training under the instruction of a competent person.

SECTION 1409. FIRE DEPARTMENT USE.

In buildings* equipped with one or more elevators*, at least one elevator shall be kept in readiness at all times for fire department use.

ARTICLE XV

MISCELLANEOUS EQUIPMENT

SECTION 1500. LIGHTING.

1. When required. Provision for artificial lighting shall be made in all those parts of buildings* to which the public has access, whenever natural light is inadequate.

2. Protection. In all buildings*, except residence-buildings*, in which flammable materials are likely to come in contact with the flame, all open flame and incandescent mantle lighting appliances shall have approved* substantial wire guards, screens or other devices to prevent effectively setting fire to such materials.

SECTION 1501. GAS-PIPING.

1. Installation.

(a). Gas-piping for lighting or fuel purposes in

*See definition, Section 200.

Sections 1501—1502

buildings* and structures* shall be installed to conform with generally accepted good practice.

(b). Except as otherwise specifically provided in this ordinance or in rules duly promulgated by the building-official*, the rules and recommendations of "American Standard Gas Safety Code" approved as an American standard by the American Standards Association and of the "Requirements for House Piping and Appliance Installation" as adopted and amended from time to time by the American Gas Association shall be deemed to be the generally accepted good practice.

NOTE.—See also "Regulations for the Installation, Maintenance and Use of Piping and Fittings for City Gas" of the National Board of Fire Underwriters.

2. **Inspection.** No person* shall use or permit the use of a new system or an extension of an old system of gas-piping in a building* or structure* before the same has been inspected and tested to insure the tightness of the system, and a certificate has been issued by the building-official*.

3. **Certificate.** The building-official* shall, within a reasonable time after being requested to do so, inspect and test or cause to be inspected and tested a system of gas-piping that is ready for such inspection and test, and if the work is found satisfactory and the test requirements are complied with, he shall issue a certificate to that effect.

4. **Supplying gas.** It shall be unlawful to supply gas to a system of gas-piping in a building* or structure* before the required* certificate has been issued.

5. **Existing work.** Nothing herein shall prohibit the use of existing systems of gas-piping without further inspection or test, unless the building-official* has reason to believe that defects exist which make the system dangerous to life or property.

SECTION 1502. PLUMBING.

1. **General.** Except as may be otherwise provided by law or ordinance, or rules duly promulgated by the

*See definition, Section 200.

building-official*, the plumbing and drainage system of a building* or structure* shall be installed in conformity with the "Recommended Minimum Requirements for Plumbing", as amended from time to time, of the Bureau of Standards, United States Department of Commerce.

NOTE.—In some localities, jurisdiction over the installation of plumbing and drainage in buildings is vested in a separate bureau or in the health officer. In such cases this subdivision should be omitted, but the balance of this section should preferably be retained as the provisions deal with matters intimately connected with the planning and construction of the building.

2. Water Supply.

(a). Every building* in which people live, work or congregate shall be provided with ample water supply installed and maintained in good repair.

(b). In every multifamily-house* there shall be in each apartment* at least one kitchen sink with running water. The space underneath such sink shall be left entirely open.

3. Toilet facilities.

(a). Except as otherwise prescribed by law or ordinance, in every existing building* not already supplied and in every building* hereafter* erected there shall be at least one water-closet, properly connected with the drainage system.

(b). In dwellings* and multifamily-houses* there shall be at least one separate water-closet within each apartment*.

(c). For places of assembly there shall be one water-closet for every one hundred persons or fraction thereof, but not less than one for each sex.

(d). In schools and other educational buildings there shall be at least one water-closet for every twenty-five persons.

(e). In every other building*, there shall be at least one water-closet for every fifteen occupants.

4. Separate toilets. In buildings* where more than one water-closet is required*, except in dwellings* and

*See definition, Section 200.

Sections 1502—1503

multifamily-houses*, separate water-closets and toilet rooms shall be provided for the sexes.

5. Toilet rooms.

(a). Water-closets and urinals shall be placed in rooms or compartments which are devoted exclusively to toilet facilities.

NOTE.—The ventilation of toilet rooms is prescribed in §501-5.

(b). In every water-closet or urinal compartment hereafter* constructed or installed, except in dwellings*, the entire floor and the side walls to a height of not less than six inches shall be made waterproof with asphalt, cement, tile, marble, slate or other approved* material impervious to water.

(c). The partitions enclosing toilet rooms shall be solid, except for the entrance door, and shall extend from the floor to the ceiling. Partitions separating water-closets or urinals within a toilet room shall not extend to the ceiling but shall be so constructed as to permit circulation of air throughout the toilet room.

6. Outside water-closets. No water-closet shall hereafter* be placed outside of a building* except, by special permission of the health officer, to replace an existing one.

7. Certificate. The certificate of occupancy required* by this ordinance, shall not be issued by the building-official* until the plumbing and drainage of the building* has been inspected, and a certificate, showing compliance with the provisions of this section and the duly adopted rules, has been issued by the official having jurisdiction.

NOTE.—Re certificate of occupancy see §104. See also note under subdivision 1 of this section.

SECTION 1503. SHUT OFF VALVES.

Every building* hereafter* erected and in every existing building* other than dwellings*, which may be

*See definition, Section 200.

supplied from some outside source with gas, vapor or fluid, except potable waters, shall have a conveniently accessible stopcock or other suitable device fixed to the supply pipes at a place outside of the building* arranged to allow the supply to be shut off. Such stopcock or other device shall be marked to indicate the contents and purpose of the supply pipe to which it is attached.

ARTICLE XVI

ELECTRICAL CONTROL

SECTION 1600. GENERAL.

1. **Installation.** No electric wiring for light, heat or power shall be installed hereafter* in a building* or structure*, nor shall an alteration or extension of an existing electric wiring system be made, except in conformity with the provisions of this article and rules that may be adopted and promulgated by the building-official* under the provisions of this ordinance.

2. **Use and maintenance.** It shall be unlawful to maintain and use electric wiring except in conformity with the provisions of this article.

SECTION 1601. METHODS AND PRACTICE.

1. **Character.** In adopting rules for electrical control, the building-official* shall embody in them the most approved methods and practices for safety of life and property.

2. **National code.** Except as may be provided otherwise in this article or in duly adopted rules, the requirements of the "National Electrical Code", being the Regulations of the National Board of Fire Underwriters for Electric Wiring and Apparatus, as approved by the American Standards Association shall be deemed to be such most approved methods and practices.

3. **Standard appliances.** Except as may be provided otherwise in this ordinance or in duly adopted rules

*See definition, Section 200.

the materials, fittings and devices enumerated in the "List of Inspected Electrical Appliances" of Underwriters' Laboratories, Inc., as revised from time to time, shall be acceptable as suitable for use under this ordinance.

SECTION 1602. INSPECTION.

1. During installation.

(a). The building-official* shall, during the installation of an electric wiring system, make or cause inspections to be made to assure compliance with this ordinance and the rules.

NOTE.—See notes under §§101-4 and 102-1. The building official should establish close cooperation with the electrical inspection bureaus or agencies of the fire insurance companies since in that way he not only will secure excellent expert inspections but also will effect economies for the municipality.

(b). No work in connection with an electric wiring system shall be covered or concealed until it has been inspected as prescribed in this subdivision and permission to do so has been given by the building-official*.

2. On completion of work. The building-official* shall, within a reasonable time after notice of the completion of electrical wiring, for which a permit is required by this ordinance, make or cause to be made an inspection of such work and such tests as may be necessary to determine that it conforms with this ordinance and the rules.

3. Reinspection.

(a). The building-official* shall make or cause to be made a reinspection of an electric wiring installation whenever he deems it necessary in the interest of public safety.

(b). If an electric wiring system upon reinspection is found to be defective and unsafe, the building-official* shall revoke all certificates, in effect at that time, relating to such system; and the use of such system shall be discontinued until it has been made to conform to this ordinance and the rules and a new certificate has been issued by the building-official*.

*See definition, Section 200.

SECTION 1603. CERTIFICATE.

Upon the filing of his report or the report of the person authorized by him to make the inspection, that an electric wiring system is lawfully installed or altered, the building-official* shall issue a certificate to that effect.

NOTE.—When suitable arrangements with the electrical inspection bureau, as suggested in the note under §1602-1a, have been made, the building official may and should, under the provisions of §101-4, recognize the certificate of such bureau as official, provided a copy has been placed on file with him.

SECTION 1604. SUPPLYING CURRENT.

1. **Restriction.** It shall be unlawful to use or permit the use of, or to supply current for, electric wiring for light, heat or power in a building* or structure*, unless the required* certificate of inspection and approval has been issued.

2. **Temporary current.** The building-official* may, in his discretion, give temporary permission for a reasonable time, to supply and use current in part of an electric installation before such installation has been fully completed and the certificate issued.

ARTICLE XVII

FIRE EXTINGUISHING EQUIPMENT

SECTION 1700. GENERAL.

1. **Installation.** Except as otherwise specifically provided by law, ordinance or duly authorized rule, buildings* shall be equipped with fire extinguishing appliances conforming to the provisions of this article.

2. **Construction.** Fire extinguishing equipments installed in accordance with regulations of the National Board of Fire Underwriters shall be deemed to conform to the provisions of this article unless inconsistent therewith.

*See definition, Section 200.

Sections 1700—1701

NOTE.—See regulations of the National Board of Fire Underwriters for the installation of "Standpipe and Hose Systems" and "Sprinkler Equipments."

3. Appliances. Appliances, fittings and devices bearing the label of Underwriters' Laboratories, Inc., or listed in "List of Inspected Fire Protection Appliances," as amended from time to time, issued by Underwriters' Laboratories, Inc., shall be deemed to be approved* and shall be accepted as conforming to the requirements of this article.

SECTION 1701. STANDPIPES.

1. When required. Buildings* heretofore* erected which are not already provided with a 4-inch or larger standpipe, and buildings* hereafter* erected shall be equipped with standpipes as follows:

(a). Buildings* exceeding fifty-five feet in height* shall have standpipes not less than four inches in diameter.

(b). Buildings* exceeding seventy-five feet in height* shall have standpipes not less than six inches in diameter.

2. Number. The number of standpipes shall be such that all parts of every floor-area* can be reached within thirty feet by a nozzle attached to one hundred feet of hose connected to a standpipe.

3. Location. Standpipes shall be so located that they are protected against mechanical and fire damage, with outlets within stairway* enclosures; provided that in buildings* heretofore* erected in which the stairways* are not enclosed, the standpipe outlets shall be located as near the stairway* as possible or they shall be outside or immediately inside of the exterior walls, within one foot of a fire tower, exterior stairway* or fire escape.

4. Construction.

(a). Standpipes shall be constructed of wrought iron or steel; and shall be designed to withstand a work-

*See definition, Section 200.

ing pressure of not less than one hundred pounds per square inch in excess of the static head of water due to the height of the standpipe.

(b). Standpipes shall extend from the lowest story* of the building* to the topmost story*; provided that standpipes serving parts of buildings* that are not of the full height of the building*, need extend only to the top story* of that part.

(c). When more than one standpipe is required* in a building*, they shall be connected at their bases by pipes of a size equal to that of the largest standpipe, to permit water from any source to supply all the standpipes.

(d). Where the water supply is furnished by a gravity tank or a pressure tank located in the building* at or above the topmost outlet, a check valve shall be provided below the tank and a stop valve between the check valve and the tank.

(e). Standpipes shall be equipped in every story* with 2½-inch hose connections and valves located not more than five feet above the floor level.

(f). Sufficient stop valves or check valves shall be provided to permit cutting off any standpipe riser without interrupting the supply to other risers from some source of supply. Stop valves which are located above the ground floor and which must be closed to permit continued use of one standpipe in case of failure of another, shall be arranged to permit operation from the ground floor or from the pump room.

(g). Only approved* fittings, connections and valves shall be used in the construction of standpipes.

NOTE.—See §1700-3.

5. Fire department connection.

(a). Standpipes shall be equipped with approved* outside Siamese connections, having check valves in each inlet. The pipe from the standpipe to the Siamese connection shall be at least four inches in diameter.

NOTE.—See §1700-3.

*See definition, Section 200.

Section 1701

(b). There shall be at least one Siamese connection to each standpipe riser.

(c). Siamese connections shall be placed not less than eighteen inches nor more than thirty-six inches above the level of the adjoining ground or sidewalk.

(d). The thread of such connections shall be uniform with that used by the fire department of the municipality*. Substantial caps to protect the threads shall be provided on each connection.

(e). Each such connection shall be suitably marked with raised letters reading "To Standpipe."

(f). Just inside of the building* in a horizontal section of the standpipe connection, an approved* straight-way check valve shall be placed, with an automatic drip connection valve between the check valve and the exterior Siamese connection to prevent freezing.

6. Hose.

(a). Standpipes located inside of buildings*, shall have approved* linen hose, sufficient to reach all parts of the floor-area* but not in excess of one hundred feet, attached to each outlet.

(b). Such hose shall be not less than two and one-half inches in diameter, and provided with couplings to conform to those of the fire department of the municipality*.

NOTE.—Standpipes are primarily for use of the fire department for extinguishing fires in upper stories of buildings. Some fire departments depend entirely upon the hose carried on the apparatus and do not consider it necessary to have 2½-inch hose attached. For such conditions 1¼- or 1½-inch hose is better suited to the use of occupants of the building, and should be required, and such hose outlets should be in the floor area rather than in the stair enclosure.

(c). Each line of hose shall be provided with washers at both ends and fitted with smooth-bore play pipe or nozzle at least twelve inches long having a 1-inch discharge outlet.

(d). Hose shall be kept on approved* hose racks or in approved* hose cabinets.

*See definition, Section 200.

7. Water supply.

(a). Standpipes shall be supplied under full pressure from an adequate water supply or the water supply shall be furnished automatically by the opening of a hose outlet or by the operation of suitably located thermostats; except in dwellings*, churches, and other buildings* having floor-areas* of less than twenty-five hundred square feet in which not less than one approved* 2½-gallon chemical extinguisher is provided for each floor-area*; and except in sprinklered* buildings* in which 1½-inch hose is connected to the sprinkler risers in each floor-area*; and except in buildings* which, because of occupancy or type of construction, do not, in the opinion of the chief of the fire department, require such constant and automatic water supply.

(b). Such water supply shall be furnished by a street main in which the pressure is sufficient to maintain a pressure of not less than fifteen pounds per square inch at outlets in the top story* of the building* with a flow of five hundred gallons per minute from a hydrant within two hundred feet of the building*; or by a gravity tank of not less than thirty-five hundred gallons capacity, having the bottom not less than twenty-five feet above the outlets in the top story* of the building*; or by a pressure tank of not less than fifty-two hundred and fifty gallons capacity (thirty-five hundred gallons of water), located in the top story* or on the roof of the building*; or by automatic pumps having a combined capacity of not less than five hundred gallons a minute.

(c). When a tank which supplies a standpipe is also used for ordinary house supply and is located at the required* height, the inlet to the house supply pipe shall be placed at a height above the bottom of the tank to reserve for fire purposes not less than the quantity of water specified for such purposes.

(d). When the pressure on an outlet exceeds fifty pounds per square inch, an approved* adjustable reducer or regulator, set to maintain a pressure of ap-

*See definition, Section 200.

Section 1701

proximately fifty pounds per square inch on the discharge side with a flow of two hundred gallons per minute through the hose and nozzle, shall be provided.

8. Pumps.

(a). In buildings* one hundred and fifty feet or more in height* and in buildings* requiring a standpipe and exceeding ten thousand square feet in area*, unless the required* water supply is furnished by an automatic pump of the capacity prescribed in this section, approved* fire pumps shall be installed in addition to the water supply that is provided, and permanently connected to the required* standpipe systems.

NOTE.—See regulations of the National Board of Fire Underwriters for the installation of "Centrifugal Fire Pumps" and "Steam Fire Pumps."

(b). The capacities of such pumps shall be not less than five hundred gallons per minute for a 4-inch standpipe; not less than seven hundred and fifty gallons per minute for a 6-inch standpipe or two interconnected 4-inch standpipes; not less than one thousand gallons per minute for two or more 6-inch standpipes.

(c). Such pumps shall have an adequate source of power and shall be supplied from street mains or from well-systems or other storage systems furnishing not less than one hour's supply at the rated capacity of pump.

9. Tests.

(a). Upon the completion of a standpipe installation and at least every two years thereafter, every standpipe shall be tested in the presence of a representative of the fire department assigned to witness such test.

(b). Such test shall consist of a static pressure test, with all outlets closed, equivalent to the designed pressure due to the height of the standpipe. Flow tests shall also be made to prove that the standpipe, line valves, check valves and Siamese connections are free from obstructions and are workable, and the fire pump is in good condition.

*See definition, Section 200.

10. Maintenance for use.

(a). In buildings* hereafter* erected required* standpipes shall be installed as the construction progresses, in such a way that they are available for use by the fire department to the topmost floor that has been constructed.

NOTE.—Compare §909-3 and 4.

(b). After the completion of a building* hereafter* erected and in buildings* heretofore* erected, standpipes and pumps, tanks and other equipment as a part of the standpipe system, shall be maintained in readiness for use at all times.

SECTION 1702. SPRINKLER EQUIPMENTS.

1. When required. Approved* automatic sprinkler equipments shall be installed as follows:

(a). Buildings* used for the manufacture, sale or storage of combustible goods or merchandise and exceeding in area* ten thousand square feet when of fireproof-construction* or seven thousand five hundred square feet when of other types of construction, shall be equipped with an automatic sprinkler system.

(b). Garages* of fireproof-construction* exceeding ten thousand square feet in area*, garages* of other types of construction exceeding six thousand square feet in area*, and garages* located in buildings* in which one or more stories* or parts thereof above such garages* are occupied* for other purposes when such garages have a capacity of twenty or more passenger automobiles, or are used as bus terminals for more than two buses, or are used for the storage and loading of two or more trucks, shall be equipped with an automatic sprinkler system.

(c). Basements* and other stories* below grade* having floor-areas* exceeding two thousand square feet, when used for the manufacture, sale or storage of com-

*See definition, Section 200.

Section 1702

bustible goods or merchandise, shall be equipped throughout with an automatic sprinkler system, except that in public-buildings*, institutional-buildings* and residence-buildings* the automatic sprinkler system will be required only in such portions as are used for storage purposes or as workshops. When adequate heat is not provided and in the opinion of the chief of the fire department the hazard is not severe, such sprinkler system may be replaced by a system having approved* automatic sprinklers, but with supply only from a fire department connection on the building front, or with an approved* protective device with fire department connection on the building front, by which water can be applied to or directed at the fire by suitable control equipment from outside the building; there being in each case an approved* automatically heat-actuated alarm system connected to an outside gong or to the central station of a supervising company."

(d). Buildings* occupied* as places of assembly and having a stage arranged or intended for theatrical, operatic or similar performances, shall be equipped in all parts, except in the auditorium, foyers and lobbies, with a sprinkler system; provided that sprinklers shall not be placed over dynamos or switchboards, or immediately under stage ventilators.

(e). Institutional-buildings* of other than fireproof-construction* or semi-fireproof-construction*, in which the occupants are bedridden, crippled, insane or otherwise involuntarily confined, shall be equipped with automatic sprinkler systems.

(f). Except as otherwise specifically prescribed, complete sprinkler systems shall be installed wherever specified elsewhere in this ordinance or in the fire prevention ordinance.

2. Sprinklers.

(a). Only approved* sprinklers shall be used in automatic sprinkler systems.

*See definition, Section 200.

NOTE.—Re sprinklers see "List of Inspected Fire Protection Appliances" of Underwriters' Laboratories, Inc.

(b). Sprinklers shall be placed to thoroughly protect all parts of the area in which they are required*.

3. Construction.

(a). Drawings of the complete layout of the sprinkler system shall be submitted to and approved by the chief of the fire department before installation is made.

(b). Piping shall be wrought iron or steel, and shall be designed to withstand, when ready for service, a water pressure of not less than one hundred and fifty pounds per square inch for two hours without leakage at joints, valves, fittings or any part of the piping.

(c). Only approved* fittings, connections and valves shall be used in the installation of sprinkler systems.

(d). When ready for service, the entire system shall be inspected and tested in the presence of a representative of the chief of the fire department. Defects developed by such inspection and test shall be corrected before final approval.

4. Gate valve.

(a). Every sprinkler system shall be provided with an approved* outside screw and yoke valve or indicator gate valve, located to be readily accessible, to control all sources of water supply except that from the fire department connection.

(b). Every sprinkler system shall be equipped with drain pipes and valves to permit the drainage of all parts.

5. Fire department connection.

(a). Every sprinkler system shall be equipped with approved* outside Siamese connections having check valves in each inlet. The pipe from the sprinkler system to the Siamese connection shall be equal in size to that of the largest riser of such sprinkler system.

*See definition, Section 200.

Section 1702

(b). There shall be such a Siamese connection on each street frontage, or, when the building* sets back of the street-lines*, on each accessible exterior wall; provided that when a frontage or exterior wall is less than fifty feet in length no such connection will be required on that frontage if the required* Siamese connections are provided on the other frontages.

(c). Siamese connections shall be placed not less than eighteen inches nor more than thirty-six inches above the level of the adjoining ground or sidewalk.

(d). The thread of such connection shall be uniform with that used by the fire department of the municipality. Substantial caps to protect the threads shall be provided on each connection.

(e). Each such connection shall be suitably marked with raised letters reading, "To Automatic Sprinklers", or, when only stories* below grade* are equipped, "To Basement Sprinklers" or "To Cellar Sprinklers".

(f). Just inside of the building*, in a horizontal section of the connection, an approved* straightway check valve shall be placed, with a drip pipe and valve between the check valve and the exterior Siamese connection to prevent freezing.

6. Water supply.

(a). Required* sprinkler systems shall be connected to two independent sources of water supply, at least one of which shall be automatic in action; provided that a connection to the street main of a reliable water system shall be deemed sufficient when tests indicate an adequate supply is available to the top line of automatic sprinklers; provided also that a Class B system, when permitted, shall not be required to have more than one source of water supply.

(b). Pressure tanks, as a source of water supply, shall contain sufficient water to supply twelve and one-half per cent of the greatest number of sprinklers within a floor-area* of any one story* for twenty minutes with an average discharge of twenty gallons per minute per sprinkler; but in no case shall the total capacity be

*See definition, Section 200.

less than forty-five hundred gallons (three thousand gallons of water).

NOTE.—See regulations of the National Board of Fire Underwriters for the construction and installation of pressure tanks.

(c). Gravity tanks, as a source of water supply, shall contain an available quantity of water sufficient to supply twenty-five per cent of the greatest number of sprinklers within a floor-area* of any one story* for twenty minutes with an average discharge of twenty gallons per minute per sprinkler; but in no case shall the available supply be less than five thousand gallons. The bottom of such a tank shall be not less than twenty feet above the highest sprinklers to be supplied thereby.

NOTE.—See regulations of the National Board of Fire Underwriters for the construction and installation of gravity tanks.

(d). Fire pumps, as part of a required* sprinkler system, shall be designed to meet the conditions and requirements in each case; but in no case shall the capacity be less than five hundred gallons per minute; provided that when a Class B sprinkler system is permitted a capacity of two hundred and fifty gallons per minute shall be deemed adequate.

NOTE.—See regulations of the National Board of Fire Underwriters for the installation of "Centrifugal Fire Pumps" and "Steam Fire Pumps."

SECTION 1703. SPECIAL PROTECTION OF HIGH BUILDINGS.

Except buildings* which are sprinklered* or equipped with some other approved* automatic extinguishing system or device, every building* exceeding seventy-five feet in height*, other than multifamily-houses*, shall be provided with automatic fire alarm system covering all portions of the building*, or be protected by watchman service during non-working hours with suitable approved watchman supervisory and manual fire alarm service; and in every undivided floor space exceeding five thousand square feet in area located more than sev-

*See definition, Section 200.

enty-five feet above grade within such buildings*, there shall be provided an approved* protective system by which water or other extinguishing agent can be applied to or directed at the fire by operating suitable control devices from outside the area affected.

SECTION 1704. AMUSEMENT PARK PROTECTION.

Within the grounds of every amusement park, fire hydrants, uniformly distributed, connected by a system of pipes to an adequate water supply, with sufficient hose, properly housed, to reach into each building*, shall be installed. All equipment shall be designed to fit fire department equipment.

ARTICLE XVIII

SIGNS AND BILLBOARDS

SECTION 1800. GENERAL.

1. Permit.

(a). No display-sign* shall hereafter* be erected, or attached to, suspended from or supported on a building* or structure* until a permit for the same has been issued by the building-official*.

NOTE.—See also §102 and §103.

(b). No permit for a display-sign* shall be issued until the required* bond has been filed.

NOTE.—Re bond see §1804.

2. **Exemption.** The provisions of this article, except as to safety, shall not apply to a sign not more than two feet in height, on or over a show window or door of a store or business establishment, announcing, without display or elaboration, only the name of the proprietor and the nature of his business; nor to a sign not exceeding one square foot of display surface,

*See definition, Section 200.

on a residence-building* stating merely the name and profession of an occupant; nor to a sign, not exceeding ten square feet of display surface, on a public-building* giving the name and nature of the occupancy and information as to the conditions of use or admission; nor to a wall sign not exceeding two and one-half square feet of display surface, nor a ground sign, advertising in either case the sale or rental of the premises upon which it is maintained; nor to street signs erected by the municipality*; nor to temporary signs or banners authorized by the local municipal legislature.

SECTION 1801. ALTERATIONS.

1. **Structural.** No display-sign* shall hereafter* be altered, rebuilt, enlarged, extended or relocated except in conformity with the provisions of this article.

2. **Movable parts.** The changing of movable parts of signs that are designed for changes, or the repainting of display matter shall not be deemed to be alterations within the meaning of this section.

SECTION 1802. EXISTING SIGNS.

Nothing in this article shall require the removal or discontinuance of a legally existing display-sign* that is not altered, rebuilt, enlarged, extended, or relocated.

SECTION 1803. CONSTRUCTION.

1. Wall signs.

(a). Display-signs* placed against the exterior walls of buildings* shall not extend more than six inches outside of the wall surface.

(b). Such signs shall not exceed forty square feet in area, unless made of incombustible materials, provided that mouldings and cappings may be of wood.

(c). Such signs shall not extend beyond the top or ends of the wall surface on which they are placed.

*See definition, Section 200.

Section 1803

2. Projecting signs.

(a). Display-signs*, fastened to, suspended from or supported by a building* or structure* so as to project therefrom at an angle, shall not extend more than four feet beyond the street-line*; provided that display-signs* not exceeding fifteen inches high, supported directly on marqueses may extend to the permissible outer limits of such marqueses.

(b). A clear space of not less than ten feet shall be provided below all parts of such signs.

3. Ground signs.

(a). Display-signs* shall not exceed fifteen feet in height above the ground on which they rest.

(b). Such signs shall be located back of the street-line* and building-line* a distance equal to not less than the height of the sign above the ground.

(c). An open space at least two feet high shall be maintained between the bottom of the sign and the ground; provided that necessary supports extending through such space, and the filling of such space with lattice or slates leaving at least fifty per cent of the space open shall not be prohibited.

(d). Such signs when more than thirteen feet high shall be constructed of incombustible materials, provided that mouldings and cappings may be of wood.

4. Roof signs.

(a). Display-signs* that are placed above or supported on the top of a building* or structure* shall be constructed of incombustible materials, provided that mouldings and cappings may be of wood.

(b). Such signs shall be set back at least eight feet from the street-line* or building-line* and shall be not more than twenty-five feet high above that part of the roof on which they rest.

(c). An open space of not less than six feet shall be maintained below the bottom of the sign, except for necessary vertical supports.

*See definition, Section 200.

(d). Within the fire-limits*, no roof sign shall be supported by or braced to wooden beams or other wood-construction of a building* or structure* over forty feet in height*.

5. **Location.** No display-sign* shall be so placed as to obstruct or interfere with a required* doorway or other required* means of egress.

6. **Stability.** Display-signs* shall be so constructed that they will withstand a wind pressure of at least thirty pounds per square foot of surface, and will be otherwise structurally safe, and shall be securely anchored or otherwise fastened, suspended or supported that they will not be a menace to persons or property.

7. **Illumination.** Display-signs* illuminated by electricity or equipped in any way with electric devices or appliances, shall conform, with respect to wiring and appliances, to the provisions of this ordinance relating to electrical control.

NOTE.—See §1600 to §1604 inclusive.

8. **Grounding.** Adequate provision shall be made for grounding metallic parts of roof signs exposed to lightning.

NOTE.—See "National Electrical Code."

SECTION 1804. BOND.

The owner* or person* in control of a display-sign* suspended over a street* or extending into a street* more than one foot beyond the building-line* shall execute a bond in a sum to be fixed by the official having control over streets*, with sureties approved by such official, indemnifying the municipality* against all loss, cost, damage or expense incurred or sustained by or recovered against the municipality* by reason of the construction or maintenance of such display-sign*.

NOTE.—See §1800-1b.

*See definition, Section 200.

of the human mind, and the influence of the environment upon the development of the individual, are the subjects of the following papers.

The first paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The second paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The third paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The fourth paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

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The sixth paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

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The ninth paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The tenth paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The eleventh paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The twelfth paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

The thirteenth paper, by Mr. J. H. Huxley, is on the "Influence of the Environment upon the Development of the Individual."

APPENDIX A

Regulations of the National Board of Fire Underwriters.

Reference has been made in parts of the preceding building code to standards of good practice to supplement its provisions for the purpose of carrying into effect the intent of such provisions. The regulations of the National Board of Fire Underwriters, listed below, have been prepared after thorough study by committees of technical men particularly qualified in the subjects covered by the regulations, and should be consulted and observed to secure the safety to which the owners and occupants of buildings are entitled. In addition the National Board of Fire Underwriters has issued a "Suggested Fire Prevention Ordinance" which should be adopted by the municipality to provide for proper coordination of requirements for occupancies of special hazards. Copies of the ordinance and the regulations may be had on application at the offices of the National Board of Fire Underwriters at 85 John Street, New York; 222 West Adams Street, Chicago; and 1014 Merchants Exchange Building, San Francisco.

ACETYLENE EQUIPMENT—1930
AIRPLANE HANGARS—1930
ANAESTHETICAL APPARATUS EMPLOYING COMBUSTIBLE
ANAESTHETICS—1929
BLOWER & EXHAUST SYSTEMS—1929
CALCIUM CARBIDE—STORAGE OF—SEE ACETYLENE EQUIPMENT
CITY GAS—INSTALLATION, ETC., OF PIPES & FITTINGS—1920
COAL GAS PRODUCERS—SEE INTERNAL COMBUSTION ENGINES
COMBUSTIBLE FIBRES—STORAGE AND HANDLING—1925
COMPRESSED GAS SYSTEMS—1927
DIP TANKS—SEE FINISHING PROCESSES
DRY CLEANING & DRY DYEING PLANTS—1925
DUST EXPLOSIONS—FLOUR & FEED MILLS, TERMINAL GRAIN ELEVATORS,
& STARCH FACTORIES—1926
ELECTRIC RAILWAY CAR HOUSES & CARS—1925
ELECTRIC WIRING & APPARATUS—NATIONAL ELECTRICAL CODE—1930
EXTINGUISHER SYSTEMS—FOAM—1926
EXTINGUISHING SYSTEMS—CARBON DIOXIDE—1929
FINISHING PROCESSES—1926—[INCLUDING DIP TANKS]
FIRE BRIGADES—PRIVATE—1930
FIRE PUMPS—CENTRIFUGAL—1929
FIRE PUMPS—STEAM—1923
FIRST AID FIRE APPLIANCES—1930
FLAMMABLE LIQUIDS—CONTAINERS FOR STORING & HANDLING—1927
FUEL SYSTEMS—PULVERIZED—1930
GAS SYSTEMS FOR WELDING & CUTTING—1930
GASOLINE VAPOR GAS MACHINES, LAMPS & SYSTEMS—1926
HOSE CONNECTIONS—FIRE DEPARTMENT—SPRINKLER & STANDPIPE SYSTEMS—
1924
HOSE HOUSES FOR MILL YARDS—1926

Appendix A—B

INCINERATORS—1928
INTERNAL COMBUSTION ENGINES & COAL GAS PRODUCERS—1922
MUNICIPAL FIRE ALARM SYSTEMS—1926
NATIONAL ELECTRICAL CODE—SEE ELECTRIC WIRING & APPARATUS
NITRO-CELLULOSE MOTION PICTURE FILMS—1926
OIL BURNING EQUIPMENTS—1928
OIL STORAGE TANKS—CONCRETE—SEE FLAMMABLE LIQUIDS
OUTSIDE PROTECTION—PRIVATE UNDERGROUND PIPING SYSTEMS—1925
PAINT SPRAYING & SPRAY BOOTHS—1928
PHOTOGRAPHIC & X-RAY NITRO-CELLULOSE FILMS—1930
PYROXYLIN LACQUER MANUFACTURING PLANTS—CONSTRUCTION
OPERATION—1930
PYROXYLIN PLASTIC—STORAGE & SALE [WAREHOUSES & STORES]—1922
PYROXYLIN PLASTIC—STORAGE & HANDLING [FACTORIES]—1928
REFRIGERATING SYSTEMS—MULTIPLE—1928
SIGNALING SYSTEMS—1929
SPRINKLER EQUIPMENTS—1928
SPRINKLER EQUIPMENTS—CLASS B—INSTALLATION OF—1930
STANDPIPE & HOSE SYSTEMS—1928.
SUGAR & COCOA—PULVERIZING SYSTEMS—1930
TANKS—GRAVITY & PRESSURE—1926
VALVES—SUPERVISION & CARE—1921
VAULTS, MERCHANDISE—CONSTRUCTION OF—1930
WALLS & PARTITIONS—PROTECTION OF OPENINGS IN—1930

The subjects covered by the "Suggested Fire Prevention Ordinance" include: explosives; pyrotechnics and small arms ammunition; nitro-cellulose motion picture film; pyroxylin plastic; photographic and x-ray nitro-cellulose film; calcium carbide and acetylene; compressed gas systems other than acetylene; flammable liquids; application of flammable finishes; dry cleaning and dry dyeing; prevention of dust explosions; hazardous chemicals; combustible fibres; refrigeration; matches; automobile garages and automobile repair shops; fire exits; fire extinguishing equipment; gas appliances and connections; miscellaneous.

APPENDIX B

Inspected Appliances.

Once every year (with semi-annual supplement) Underwriters' Laboratories of Chicago, Illinois, issues its "List of Inspected Fire Protection Appliances" in which are enumerated materials, assemblies, devices and appliances which have been tested to determine their value with respect to fire resistance and fire protection, together with the conditions to be observed to secure the service for which they are designed. This list should be freely consulted.

In connection with the listings, systematic inspections are made of subsequent factory output to assure the maintenance of standards that have been set up. As evidence of such in-

spections and so that they may be recognized wherever found, devices of most of the more important classes are stamped or labeled, including the words "Underwriters' Laboratories Inspected."

Among the more important classes of devices listed and having a relation to this code are standpipes, sprinkler equipments, pumps, hose, extinguishers, and other appliances for fire protection, doors and shutters, window frames, window accessories, wired glass, roof covering materials and concrete building units. Anything included in this List should be acceptable as approved, within the meaning of that term as used in the Building Code, to such extent and with such limitations as are indicated by the information, findings, and/or classifications set forth in the above-mentioned List. Certain products appear therein in several graded classifications and in making selections from these products care should be taken to select products of the specifically appropriate classification.

Wherever the code prescribes the use of an approved protective, only devices of a class that will fulfill the requirements of the particular service, should be accepted. Particular attention is called to the devices which are designed to protect various types of openings. These devices, including doors, windows and shutters, are rated and classed according to the hazards involved to afford the necessary protection required under the conditions of service. The Regulations of the National Board of Fire Underwriters for the Protection of Openings in Walls and Partitions Against Fire give detailed requirements for their use and installation.

Doors for Class A situations are designed for the protection of openings in walls between separate buildings or sections of buildings. They should always be provided in firewalls (§ 1005-2b); and in proscenium walls in buildings in which a stage for dramatic or similar performances is installed (§ 1301-8a). In every opening of this character double protection should be provided in the form of a standard fire door at each face of the wall.

Doors for Class B situations are designed for the protection of openings in enclosures to vertical communications through buildings. They should be required for openings in stairway enclosures (§ 604-2d); for doors to fire towers (§ 605); on all shafts (§ 1009-4b, § 1101-4b); in walls of intake rooms and vaults of forced draft systems (§ 1204-6b, § 1204-7c); for doors leading to incinerator rooms (§ 1206-3b, § 1206-3e); for service doors in incinerator chutes (§ 1206-3g); in walls and partitions within stage enclosures (§ 1301-8a); and in walls or partitions separating garages from other occupancies (§ 1304).

Doors for Class C situations are designed for the protection of openings in corridor and room partitions. They should be used on openings in partitions between rooms or between rooms and

Appendix B—C

corridors in buildings of fireproof or semifireproof construction. They must not be used for Class B situations.

Doors and shutters for Class D situations are designed for the protection of openings in exterior walls subject to severe fire exposure. Doors at openings in fire-partitions when used as horizontal exits (§ 606-6); doors leading to exterior stairs (§ 607-2); and doors to the outer air from stages (§ 1301-8a) should be of this type. Doors and shutters for these situations should have no glass lights or glass panels.

Doors, shutters and windows for Class E situations are designed for the protection of openings in exterior walls subject to moderate fire exposure. Windows of this type should be used in all window openings along the line of exterior stairs and fire escapes (§ 607-3); under vestibules and balconies to fire towers and horizontal exits (§ 606-6); and within ten feet of balconies or bridges serving as horizontal exits.

Doors and windows for Class F situations are designed for the protection of openings in exterior walls subject to light fire exposure.

Wired glass, one-quarter inch thick, is suitable for use in fire windows for protection against moderate fire exposures (Class E situations) where the exposed area of each light is not more than 720 square inches, with the vertical dimension not more than 54 inches and the horizontal dimensions not more than 48 inches; in fire windows for protection against light fire exposures (Class F situations) where the exposed area of each light is not more than 2,916 square inches, with neither dimension more than 54 inches; and in fire doors for openings in corridor and room partitions (Class C situations) where the exposed area of each light is not more than 1,296 square inches.

APPENDIX C

Standard Fire Test.

The Standard Fire Test referred to in this building code and defined as "the test formulated under the auspices of the American Standards Association as 'American Standard' or as 'Tentative American Standard,'" was prepared under the joint sponsorship of the U. S. Bureau of Standards, the A. S. A. Fire Protection Group (Associated Factory Mutual Fire Insurance Companies, National Board of Fire Underwriters, National Fire Protection Association and Underwriters' Laboratories) and the American Society for Testing Materials. This specification was based on earlier standards developed by a committee of the American Society for Testing Materials, adopted in 1907 and 1909, respectively, for the testing of fireproof floors and fireproof partitions, following a procedure used for more than a decade previously by the building authorities of New York City. The fire

test specification was approved November 8, 1926, as "Tentative American Standard" by the American Standards Association.

TENTATIVE SPECIFICATIONS FOR FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS

The performance of walls, columns, floors and other building members under fire exposure conditions is an item of major importance in securing constructions which are safe and which are not a menace to neighboring structures nor to the public. Recognition of this is registered in the codes of many authorities, municipal and other. It is important to secure balance of the many units in a single building, and of buildings of like character and use in a community; and also to promote uniformity in requirements of various authorities throughout the country. To do this it is necessary that the fire-resistive properties of materials and assemblies be measured and specified according to a common standard expressed in terms which are applicable alike to a wide variety of materials, situations and conditions of exposure.

Such a standard is found in the specifications which follow. They prescribe a standard exposing fire of controlled extent and severity. Performance is defined as the period of resistance to standard exposure elapsing before the first critical point in behavior is observed. Results are reported in units in which field exposures can be judged and expressed.

The specifications may be cited as the "Standard Fire Test Specification" and the performance or exposure shall be expressed as "2-hour," "6-hour," " $\frac{1}{2}$ -hour," etc.

When a factor of safety exceeding that inherent in the test conditions is desired, a proportional increase should be made in the specified time-classification period.

Classifications of assemblies involving combustibles in sufficient quantity or so arranged as to continue burning after the derived time period shall be designated by the term "combustible" after the period assigned.

1. (a) The test methods are applicable to assemblies of masonry units and to composite assemblies of structural materials for buildings, including bearing and other walls and partitions, columns, girders, beams and slabs and composite slab and beam assemblies for floors and roofs. They are also applicable to other assemblies and structural units which constitute permanent integral parts of a finished building.

(b) It is the intent that classifications shall register performance during the period of exposure and shall not be construed as having determined suitability for use after fire exposure.

Appendix C

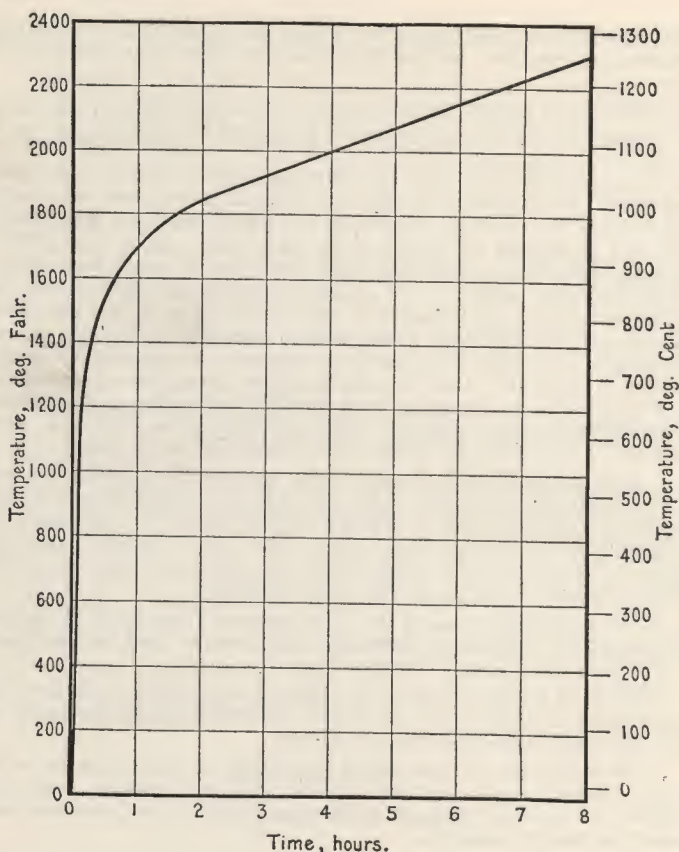


Fig. 14.
Time Temperature Curve.

I. CONTROL OF FIRE TESTS

2. The conduct of fire tests of materials and construction shall be controlled by the standard time-temperature curve shown in Fig. 14. The points on the curve which determine its character are:

| | | | |
|------------------------|----------|----|------------|
| 1000°F. (approximately | 538°C.) | at | 5 minutes |
| 1300°F. (" | 704°C.) | at | 10 minutes |
| 1550°F. (" | 843°C.) | at | 30 minutes |
| 1700°F. (" | 927°C.) | at | 1 hour |
| 1850°F. (" | 1010°C.) | at | 2 hours |
| 2000°F. (" | 1093°C.) | at | 4 hours |
| 2300°F. (" | 1260°C.) | at | 8 hours |

3. (a) The temperature fixed by the curve shall be deemed to be the average temperature obtained from the readings of several thermocouples (not less than three) symmetrically disposed and distributed to show the temperature near all parts of the sample, the thermocouples being enclosed in sealed porcelain tubes $\frac{3}{4}$ -inch in outside diameter and of $\frac{1}{8}$ -inch wall thickness. The exposed length of the porcelain tube and couple in the furnace chamber shall be not less than 12-inch. Other types of protecting tubes or pyrometers may be used that under test conditions give the same indications as the above standard within the limit of accuracy that applies for furnace-temperature measurements. For greater difference of design and size the time-temperature curve followed shall be modified to give an exposure equal to that obtained by using the standard pyrometer and curve above described.

(b) The temperatures shall be read at intervals not exceeding 5 minutes during the first hour, and thereafter the intervals may be increased to not more than 15 minutes.

(c) The accuracy of the furnace control shall be such that the area under the time-temperature curve, obtained by averaging the results from the pyrometer readings, is within 15 per cent. of the corresponding area under the standard time-temperature curve shown in Fig. 1 for fire tests of one hour or less duration; within 10 per cent. for those over one hour and not more than two hours; and within 5 per cent. for tests exceeding two hours in duration.

4. (a) Temperatures at unexposed surfaces shall be measured with thermocouples or thermometers¹ placed under oven dry asbestos fire felt pads 6 in. square, 0.4 in. thick and weighing not less than 1.0 lb. per sq. ft. nor more than 1.4 lb. per sq. ft. The wire leads of the thermocouple or the stem of the thermometer shall have an immersion under the pad and be in contact with the unexposed surface for not less than $3\frac{1}{2}$ in. The hot junction of the thermocouple or the bulb of the thermometer shall be placed approximately under the center of the pad. The outside diameter of protecting tubes of glass, clay or porcelain, and of thermometer stems, shall not be more than $\frac{5}{16}$ in. The pad shall be held firmly against the surface, and shall fit closely about the thermocouples or thermometer stems. Thermometers shall be of the partial-immersion type, with a length of stem, between the end of the bulb and the immersion mark, of 3 in. The wires for the thermocouple in the length covered by the pad shall not be heavier than No. 18 B. & S. gage (0.04 in.) and shall be electrically insulated with heat- and moisture-resistant coatings.

(b) The temperature readings shall be taken at not less than five points on the surface, one of which shall be approximately

1. Under certain conditions it may be unsafe or impracticable to use thermometers.

Appendix C

at the center, and four at approximately the centers of the quarter sections. If additional points are used they shall be symmetrically disposed about the center, with no location nearer than $1\frac{1}{2}$ times the thickness of the construction, or nearer than 12 in., to the edges. None shall be located opposite or on top of beams, girders, pilasters or other structural members.

(c) Temperature readings shall be taken at intervals not exceeding 15 minutes until a reading exceeding 212° F. (100° C.) has been obtained at any one point. Thereafter the readings may be taken more frequently at the discretion of the testing body, but the intervals need not be less than 5 minutes.

(d) Where the Conditions of Acceptance place a limitation on the rise of temperature of the unexposed surface, the temperature end point of the fire endurance period shall be determined by the average of the measurements taken at individual points; excepting that if a temperature rise 30 per cent in excess of the specified limit occurs at any one of these points, the remainder shall be ignored and the fire endurance period judged as ended.

II. CLASSIFICATION AS DETERMINED BY TEST

5. Results shall be reported in accordance with the performance in the tests prescribed in these specifications. They shall be expressed in time periods of resistance, as for example, 4-hour, $\frac{1}{2}$ -hour, etc.

III. TEST STRUCTURES

6. (a) The test structure may be located at any place where all the necessary facilities for properly conducting the test are provided.

(b) Entire freedom is left to each investigator in the design of his test structure and the nature and use of fuel, provided the test requirements are met.

IV. TEST SAMPLES

7. The test samples shall be truly representative of the construction for which classification is desired, and shall be built under conditions representative of those obtaining as practically applied in building construction. The physical properties of the materials and/or ingredients used in the test sample shall be determined and recorded.

V. CONDUCT OF FIRE TESTS

8. The fire endurance test on the sample with its applied load, if any, shall be continued until failure occurs, or until it has withstood the test conditions for a period equal to that herein specified in the Conditions of Acceptance for the given type of construction.

9. (a) Where required by the Conditions of Acceptance, a duplicate sample shall be subjected to a fire exposure test for a period equal to one-half of that indicated as the resistance period in the fire endurance test, but not for more than one hour, imme-

diately after which the sample shall be subjected to the impact, erosion and cooling effects of a fire hose stream directed first at the middle and then at all parts of the exposed face, changes in direction being made slowly.

(b) The fire hose stream test shall not be required in the case of constructions having a resistance period, indicated in the fire endurance test, of one-half hour or less.

(c) The submitter may elect, with the advice and consent of the testing body, to have the fire hose stream test made on the sample subjected to the fire endurance test and immediately following the expiration of the fire endurance test; provided, that the testing body reserves the right to decide that a fire hose stream test should be made on a duplicate sample as specified in Paragraph (a).

(d) The stream shall be delivered through 2½-in. hose, discharging through a National Standard Playpipe of corresponding size equipped with a 1½-in. discharge tip of the standard taper smooth-bore pattern without shoulder at the orifice. The water pressure and duration of application shall be as specified in Table I.

TABLE I.

| Parts of Structure | Resistance Period | Water Pressure at Nozzle lb. per sq. in. | Duration of Application, minutes per 100 sq. ft. exposed area |
|----------------------|---|--|---|
| Floors and Roofs | 8 hours and over..... | 45 | 6 |
| | 4 hours and over if less than 8 hours.... | 45 | 5 |
| | 2 hours and over if less than 4 hours.... | 45 | 2½ |
| | 1 hour and over if less than 2 hours..... | 30 | 1½ |
| | Less than 1 hour..... | 30 | 1 |
| Walls and Partitions | 8 hours and over..... | 45 | 6 |
| | 4 hours and over if less than 8 hours.... | 45 | 5 |
| | 2 hours and over if less than 4 hours.... | 30 | 2½ |
| | 1 hour and over if less than 2 hours..... | 30 | 1½ |
| | Less than 1 hour..... | 30 | 1 |

(e) The nozzle orifice shall be 20 ft. from the center of the exposed surface of the test sample if the nozzle is so located that when directed at the center its axis is normal to the surface of the test sample. If otherwise located its distance from the center shall be less than 20 ft. by an amount equal to 1 ft. for each 10 degrees of deviation from the normal.

10. The material or construction shall not be tested until a large proportion of its final strength has been attained, and, if it contains free water, until the excess has been given off: this

Appendix C

will usually require about 30 days' time under favorable drying conditions. Where this cannot be attained within 40 days, artificial drying with air temperature not exceeding 100° F. (38° C.) shall be used.

VI. TESTS OF BEARING WALLS AND PARTITIONS.

11. The area exposed to fire shall be not less than 100 sq. ft., with neither dimension less than 9 ft. The test specimen shall not be restrained on its vertical edges.

12. During the fire endurance and fire and fire stream tests the construction shall be loaded in a manner calculated to develop theoretically as nearly as practicable the working stresses contemplated by the design.

13. The test shall not be regarded as successful unless the following conditions are met:

(a) The wall or partition shall have sustained the applied load during the fire endurance test without passage of flame or gases hot enough to ignite cotton waste, for a period equal to that for which classification is desired.

(b) The wall or partition shall have sustained the applied load during the fire and fire stream test as specified in Section 9, without passage of flame, stream or gases hot enough to ignite cotton waste, and after cooling but within 72 hours after its completion shall sustain a total load equal to the dead load plus twice the superimposed load specified above.

(c) The fire-stopping, if any, shall have functioned to prevent passage of fire for a period equal to that for which classification is desired.

(d) Transmission of heat through the wall or partition during the fire endurance test shall not have been such as to raise the temperature on its unexposed surface more than 250° F. (139° C.) above its initial temperature.

VII. TESTS OF NON-BEARING WALLS AND PARTITIONS.

14. The area exposed to fire shall be not less than 100 sq. ft. with neither dimension less than 9 ft. The test specimen shall be restrained on all four edges.

15. The test shall not be regarded as successful unless the following conditions are met:

(a) The wall or partition shall have withstood the fire endurance test without passage of flame or gases hot enough to ignite cotton waste, for a period equal to that for which classification is desired.

(b) The wall or partition shall have withstood the fire and fire stream test as specified in Section 9, without passage of flame, stream or gases hot enough to ignite cotton waste.

(c) The fire-stopping, if any, shall have functioned to prevent passage of fire for a period equal to that for which classification is desired.

(d) Transmission of heat through the wall or partition during the fire endurance test shall not have been such as to raise the temperature on its unexposed surface more than 250° F. (139° C.) above its initial temperature.

VIII. TESTS OF COLUMNS.

16. The length of the column exposed to fire shall, when practicable, approximate the maximum clear length contemplated by the design, and for building columns shall not be less than 9 ft. The contemplated details of connections, and their protection if any, shall be applied according to the methods of acceptable field practice.

17. (a) During the fire endurance test the column shall be loaded in a manner calculated to develop theoretically as nearly as practicable the working stresses contemplated by the design. Provision shall be made for transmitting the load to the exposed portion of the column without unduly increasing the effective column length.

(b) If the submitter and the testing body jointly so decide, the column may be subjected to $1\frac{3}{4}$ times its designed working load before the fire endurance test is undertaken. The fact that such a test has been made shall not be construed as having had a deleterious effect on the fire endurance test performance.

18. The test shall not be regarded as successful unless the column shall have sustained the applied load during the fire endurance test for a period equal to that for which classification is desired.

IX. TESTS OF FLOORS AND ROOFS.

(The following contemplates application of fire exposure to the under side of constructions, and omission from the upper surface of all units which are not essential to the constructions. Specifications and test procedure with fire applied to the upper side have not been developed.)

19. The area exposed to fire shall be not less than 180 sq. ft. with neither dimension less than 12 ft. Beams or girders if a part of the construction under test shall lie within the combustion chamber and have a clearance of not less than 8 in. from its walls.

20. During the fire endurance and fire and fire stream tests the construction shall be loaded in a manner calculated to develop theoretically as nearly as practicable the working stresses in each member contemplated by the design.

21. The test shall not be regarded as successful unless the following conditions are met:

Appendix C

(a) The construction shall have sustained the applied load during the fire endurance test without passage of flame or gases hot enough to ignite cotton waste, for a period equal to that for which classification is desired.

(b) The construction shall have sustained the applied load during the fire and fire stream test as specified in Section 9, without passage of flame, stream or gases hot enough to ignite cotton waste, and after cooling but within 72 hours after its completion shall sustain a total load equal to the dead load plus twice the superimposed load specified above.

(c) Transmission of heat through the construction during the fire endurance test shall not have been such as to raise the temperature on its unexposed surface more than 250° F. (139° C.) above its initial temperature.

X. TESTS OF FINISH FOR WALLS, PARTITIONS AND CEILINGS.

22. The test panel shall be a wall, partition or floor.

(a) Test panels carrying interior wall and partition finish shall be finished on both faces with the finish which is the subject of the test; excepting that with the advice or consent of the testing body this provision may be waived with respect to panels of solid or masonry construction.

(b) Test panels carrying exterior wall finish on the exposed face shall be finished on the unexposed face with an interior wall finish judged by the testing body to be suitable for purposes of the test; excepting that with the advice or consent of the testing body this provision may be waived with respect to panels of solid or masonry construction.

(c) Test panels carrying ceiling finish shall be finished on the upper face with a flooring judged by the testing body to be suitable for purposes of the test; excepting that with the advice or consent of the testing body this provision may be waived with respect to panels of solid or masonry construction.

23. The area exposed to fire shall be for tests of wall and partition finish, not less than 100 sq. ft., with neither dimension less than 9 ft.; for tests of ceiling finish, not less than 180 sq. ft., with neither dimension less than 12 ft.

24. The test shall not be regarded as successful unless the following conditions are met:

(a) The finish shall have withstood the fire endurance test without developing openings capable of passing flame or hot gases, for a period equal to that for which classification is desired.

(b) The finish shall have withstood the fire and fire stream test as prescribed respectively for floors, walls and partitions as

specified in Section 9, without developing openings capable of passing flame, hot gases or stream.

(c) Transmission of heat through the finish during the fire endurance test shall not have been such as to raise the temperatures at its contact with the structural members of the test panel or elsewhere on its unexposed surface more than 250° F. (139° C.) above the initial temperatures at these points.

APPENDIX D

Fire Test Data.

The large majority of fire tests on structural materials and assemblies have been made at Underwriters' Laboratories, Chicago, Illinois, the Bureau of Standards of U. S. Department of Commerce, Washington, D. C., and at the Columbia University Fire Testing Station, New York, N. Y.

The most comprehensive series of fire tests made on any one structural element of a building, was conducted jointly at Underwriters' Laboratories, Chicago, Illinois, in 1917 to 1919, by the National Board of Fire Underwriters, the Associated Factory Mutual Fire Insurance Companies and the U. S. Bureau of Standards. The series consisted of 106 tests of columns, of which 91 were fire tests and 15 fire and water tests. The results are published in a report that can be purchased from Underwriters' Laboratories, 207 East Ohio Street, Chicago, Illinois.

Reports of tests made at Underwriters' Laboratories are not available except so far as the manufacturers for whom the tests have been made authorize publication of the full information. The fire-resistance ratings and the conditions of service are given, so far as appropriate, in "List of Inspected Fire Protection Appliances" referred to in Appendix B. Copies of reports that have been made public can possibly be obtained from the manufacturers.

Fire tests made at the Bureau of Standards are reported in its publications after a thorough study and complete analysis of the test results have been made. The earlier publications containing such reports were the "Technologic Papers." Since 1928 such information is given in the "Journal of Research" issued monthly. Among the more important titles are:

"Fire Resistance of Hollow Load-Bearing Wall Tile,"
by S. H. Ingberg and H. D. Foster, Journal of
Research, January, 1929.

"Fire Tests of Building Columns," by S. H. Ingberg,
H. K. Griffin, W. C. Robinson and R. E. Wilson.
Technologic Paper No. 184, April, 1921. (This
publication is the same as the report on fire tests
of columns made at Underwriters' Laboratories.)

Appendix D—E

"A Comparison of Heat Insulating Properties of Some of the Materials Used in Fire-Resistive Construction," by Walter A. Hull. Technologic Paper No. 130, November, 1919.

"Fire-Resistance of Concrete Columns," by W. A. Hull and S. H. Ingberg. Technologic Paper No. 272, 1925.

A list of the publications by the Bureau of Standards may be had on request.

Practically all of the fire tests made under the auspices of the building authorities of New York City are made at the Columbia University Fire Testing Station or at the Laboratory of the Department of Civil Engineering of that institution. Reports on all official tests are filed with the building authorities where they are open to public inspection.

Pending the completion of the full report, the Bureau of Standards has issued Letter Circulars 228 and 229, under date of June 8, 1927, giving information relative to fire tests made on walls of clay bricks, shale bricks, concrete bricks and sand-lime bricks. A fuller account of these tests was published in "The American Architect and The Architectural Review" for September 26 and October 10, 1923.

APPENDIX E

Standard Specifications

American Society for Testing Materials.

It is the intent of the building code (§§ 101-5a, 700 and 800) that the materials used and the practices followed in the construction of buildings shall conform to the generally accepted standards of governmental bureaus, national technical organizations and fire underwriters, as the same may be amended from time to time. The regulations of the National Board of Fire Underwriters have already been referred to in Appendix A. Below is given a list, as of September 3, 1929 (with the society's identifying designations) of the standard specifications for various materials entering into building construction. Like the underwriters' regulations they have been prepared after much study and research by committees of men technically well qualified to fix these standards. They may be accepted as representing the best practice; and materials conforming to them should be accepted as meeting the requirements of this code within the limitations and conditions inherent in the standards or fixed by the code.

| | |
|---------|---|
| A 9-29 | Structural Steel for Buildings. |
| A 15-14 | Billet-Steel Concrete Reinforcement Bars. |
| A 16-14 | Rail-Steel Concrete Reinforcement Bars. |

- A 82-27 Cold-Drawn Steel Wire for Concrete Reinforcement.
- A 27-24 Steel Castings.
- A 44-04 Cast-Iron Pipe and Special Castings.
- A 74-29 Cast-Iron Soil Pipe and Fittings.
- A 48-29 Gray-Iron Castings.
- C 9-26 Portland Cement.
- C 9-16T Compression Strength of Portland Cement Mortars.
- C 10-09 Natural Cement.
- C 5-26 Quicklime for Structural Purposes.
- C 6-24 Hydrated Lime for Structural Purposes.
- C 66-27T Sand for Use in Lime Plaster.
- C 61-29T Keene's Cement.
- C 28-27 Gypsum Plasters.
- C 35-25 Gypsum Plastering Sand.
- C 36-25 Gypsum Wall Board.
- C 37-25 Gypsum Plaster Board.
- C 52-27 Gypsum Partition Tile or Block.
- C 26-27 Testing Gypsum and Gypsum Products.
- C 33-28T Concrete Aggregates.
- C 31-27 Making and Storing Specimens of Concrete in the Field.
- C 39-27 Making Compression Tests of Concrete.
- C 42-27 Securing Specimens of Hardened Concrete from the Structure.
- C 29-27 Test for Unit Weight of Aggregate for Concrete.
- C 30-22 Method of Test for Determination of Voids in Fine Aggregate for Concrete.
- C 40-27 Test for Organic Impurities in Sands for Concrete.
- C 41-24 Test for Sieve Analysis of Aggregates for Concrete.
- D 136-28 Decantation Tests for Sand and for Fine Aggregates.
- D 138-26T Test for Consistency of Portland Cement Concrete.
- C 58-28 Definition of the Term Sand.
- C 58-28T Definition of the Term Aggregate.
- E 13-28T Definition of the Term Screen (Sieve).
- C 44-22T Inspection of Concrete and Reinforced Concrete Work.
- C 62-29 Building Brick (Made from Clay or Shale).
- C 55-28T Concrete Building Brick.
- C 73-28T Sand-Lime Building Brick.
- C 67-28T Testing Brick.
- C 34-27 Hollow Burned-Clay Load-Bearing Wall Tile.
- C 56-28T Hollow Burned-Clay Fireproofing, Partition and Furring Tile.
- C 57-27 Hollow Burned-Clay Floor Tile.
- C 43-24 Terms Relating to Hollow Tile.
- C 19-26T Fire Tests of Building Construction and Materials (see Appendix C).
- D 245-27 Structural Wood Joist, Planks, Beams, Stringers and Posts.
- D 143-27 Testing Small Clear Specimens of Timber.

Appendix E

- D 198-27 Conducting Static Tests of Timber in Structural Sizes.
- D 9-15 Terms Relating to Structural Timber.
- D 312-29T Asphalt for Use in Constructing Built-Up Roof Coverings.
- D 251-27 High-Carbon Coal-Tar Pitch for Use in Constructing Built-Up Roofs Surfaced with Slag or Gravel.
- D 252-27 High-Bitumen Coal-Tar Pitch for Use in Constructing Built-Up Roofs Surfaced with Slag or Gravel.
- D 224-27 Asphalt Roll-Roofing Surfaced with Powdered Talc.
- D 248-27 Asphalt Roll-Roofing Surfaced with Granular Talc.
- D 225-29 Asphalt Roll-Roofing and Asphalt Shingles Surfaced with Mineral Granules.
- D 249-27 Heavy Weight Asphalt Roll-Roofing and Heavy Weight Asphalt Shingles Surfaced with Mineral Granules.
- D 226-27 Asphalt-Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-Up Roofs.
- D 227-27 Coal-Tar Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-Up Roofs.
- D 250-27 Asphalt-Saturated Asbestos Felt for Use in Constructing Built-Up Roofs.
- D 146-27 Testing Felted and Woven Fabrics Saturated with Bituminous Substances for Use in Waterproofing and Roofing.
- D 228-27 Testing Asphalt Roll-Roofing Surfaced with Fine Talc, Granular Talc, or Mineral Granules, Likewise Asphalt Shingles Surfaced with Mineral Granules.
- D 272-29T Analysis of Roofing Felt for Fiber Composition.

The American Standards Association has also adopted standards, some of which, as indicated below, are included in the above A.S.T.M. specifications.

- A 2-1926 Fire Tests of Building Construction and Materials (A.S.T.M. C 19-26T).
- A 1-1928 Portland Cement (A.S.T.M. C 9-26).
- A 27-1924 Test for Apparent Specific Gravity of Coarse Aggregate (A.S.T.M. C 30-18).
- A 38-1927 Sizes of Steel Spiral Rods for Concrete Reinforcement.
- O 4a-1927 Testing Small, Clear Specimens of Timber (A.S.T.M. D 143-27).
- O 4b-1927 Static Tests of Timbers in Structural Sizes (A.S.T.M. D 198-27).
- A 19-1923 Test for Voids in Fine Aggregate for Concrete (A.S.T.M. C 30-22).

APPENDIX F

Wind Pressures.

Wind pressures on buildings vary with wind velocities. There is a considerable difference between the wind velocities in different sections of the country. Again, the velocity in any one locality is changeable. The velocity of the wind at any one time varies with the distance above the surface of the ground. Information regarding prevalent wind conditions in various localities can be secured from the U. S. Weather Bureau. But it is important to know under what conditions and at what heights the readings in any particular case were taken.

In the past the records of wind velocities generally have been made with a four-cup anemometer, which, it has been found, gives values somewhat higher than the actual wind velocities, the error being very large for the higher velocities, as shown in the table below. The pressure per square foot on flat surfaces, until recently, was determined by the formula,

$$P = 0.003 V^2$$

in which P is the pressure in pounds per square foot and V is the wind velocity in miles per hour. Pressure readings, in the recent past, by the Pitot tube indicate that the values derived by the formula may not be the true values.

In the following table, compiled from data in "American Civil Engineers' Pocket-book," are given true wind velocities with the corresponding velocities recorded by the four-cup anemometer, and resultant wind pressures. There are also given wind pressures calculated for the velocities given as true velocities by the formula just referred to. It is suggested that, as the matter of wind pressure is still a subject of incompleting investigation at the U. S. Bureau of Standards, these latter values be used as the more conservative practice.

| True Velocity miles per hour | Indicated Velocity 4-cup Anemometer miles per hour | Pressure by Pitot Tube lbs. per sq. ft. | Pressure by Formula $P = 0.003 V^2$ lbs. per sq. ft. |
|---------------------------------|--|---|--|
| 50 | 64 | 6.39 | 7.5 |
| 60 | 78 | 9.21 | 10.8 |
| 70 | 91 | 12.53 | 14.7 |
| 80 | 105 | 16.36 | 19.2 |
| 90 | 118 | 20.71 | 24.3 |
| 100 | 132 | 25.57 | 30.0 |
| 110 | 145 | 30.94 | 36.3 |
| 120 | | 36.82 | 43.2 |

The value to be used in the building code, 704-1, should be based on the maximum wind velocity reported for the locality; but should in no case be taken at less than fifteen pounds.

A full discussion of this matter will be found in "Wind Stresses in Buildings" by Robins Fleming, Structural Engineer, American Bridge Company.

APPENDIX G

Earthquakes.

Earthquakes are of more frequent occurrence than is generally supposed. The historical record indicates that practically no part of the United States has been entirely free from such disturbances; but comparatively few parts of the country have been subject to earthquakes of a severity to produce heavy damage to buildings. Experience, however, shows that in those areas which have been visited by major earthquakes, a recurrence is more than likely, though the intervals between visitations may be a number of years. In these latter regions it is desirable that suitable provisions be incorporated in the building code to safeguard buildings against the destructive forces of these physical occurrences.

The prime requisites in the construction of earthquake-resistant buildings are rigidity and workmanship. In buildings of the skeleton type of construction adequate bracing, to take up the lateral forces, must be provided. Masonry walls and interior partitions should preferably be a type that is reinforced, with the reinforcing steel, in skeleton frame construction, carried around the vertical members. It is most important that foundations be continuous under the entire structure, or, when that is not practicable, that at least all footings be interconnected. So far as location, shape and height can be controlled by statute, provision might be made advantageously to require buildings to stand apart; to be as nearly as possible square in plan and to avoid U-shaped or L-shaped outlines; to diminish in area as their height increases; and to limit the heights to which they may be erected. Design factors which are generally recommended, as having been found satisfactory, are based on the experience with structures not over one hundred feet high.

Accurate data of actual measurements to serve as a basis for designing earthquake-resistant buildings are still too meager for positive conclusions. Systematic research in this respect, in this country, at least, has only recently been started. But experiences in Japan with buildings designed in accordance with certain principles and successfully withstanding the severe shocks of the 1923 disturbances, seem to justify certain legal requirements. For those localities where legislation is desirable, the following provisions are suggested. They may be properly incorporated in Article VII of this code, preferably as a section immediately following that on wind pressure, § 704.

§ Resistance to earthquakes. 1. When required. Buildings* more than one story* high above a basement* or cellar*, and buildings* or other structures* exceeding twenty feet in height*, except buildings* of frame-construction* or unprotected-metal-construction*, shall be designed and constructed to resist the effect of earthquake shocks in accordance with the requirements of this section.

2. Forces to be resisted. (a). The forces to be resisted shall be assumed to be applied horizontally at each floor level at right angles to the side of the building from any direction.

(b). Such forces shall be assumed at the following percentages of the weight of the building* or structure* above the plane of application: five per cent when the foundations rest on rock or hardpan; seven and one-half per cent when they rest on soil the bearing capacity of which is not less than two tons per square foot; and ten per cent when they rest on soil the bearing capacity of which is less than two tons per square foot.

(c). The weight of the building* or structure* shall be taken to include the dead-load* and the total live-loads* prescribed by this ordinance as minimum, or for which the building* or structure* is designed when in excess of the prescribed minimum.

3. Stresses. The construction shall be so designed that the resultant stresses in the structural elements and in their connections, due to the assumed forces prescribed in this section combined with stresses otherwise produced, shall not exceed those specified in this ordinance by more than thirty-three and one-third per cent; provided that in structural steel such stresses may be exceeded by not more than fifty per cent; that rivets in tension may be stressed to fourteen thousand pounds per square inch; and that masonry, unless reinforced in an approved* manner, shall not be stressed more than forty pounds per square inch in shear or tension.

4. Bonding and tying. (a). All parts of buildings* and structures* shall be so bonded and tied together that the entire assembly shall act as a unit.

(b). The floors throughout shall be designed of sufficient strength and rigidity to transmit the horizontal forces to the several vertical resisting bents in proportion to their stiffness.

(c). Veneers and other wall facings, cornices, and ornamental details shall be thoroughly bonded to the construction to form an integral part of it, whether on the exterior or interior of the building* or structure*.

(d). Exterior walls of buildings* of unit masonry construction shall be tied together at each floor level by steel rods continuous across the building*, or by other adequate ties. All masonry walls meeting at an angle shall be thoroughly bonded.

(e). Lintels over openings in walls shall be securely anchored where they rest on the masonry.

5. Foundations. (a). So far as practicable, foundation walls shall be continuous under the entire building* or structure*.

Appendix G—H

(b. In buildings* in which foundations do not consist of continuous walls, or consist, wholly or in part, of piers, spread footings, caissons, piling nests or other forms of isolated footings, all such footings shall be completely interconnected by members of reinforced-concrete* or of structural steel encased in concrete*, of sufficient strength to transmit in tension and compression one-tenth of the vertical load, including the total live-loads*, supported by the more heavily loaded of the two connected footings.

APPENDIX H

Floor Loads for Various Occupancies.

In the improvement of vacant property by the erection of a new business building, it is not always practicable to foretell definitely what the occupancy will be. A minimum load for which the floors must be designed is therefore prescribed (§ 703-2), subject to the provision that, aside from such minimum, floors intended for occupancies involving greater loads must be designed of sufficient strength to safely sustain such loads, and subject also to the restriction against placing greater loads on the floors than those for which they are designed. For the majority of cases the prescribed minimum loads are ample. As a guide to those who are planning for probable higher loads and as an aid to the building official in judging the loadings resulting from different occupancies, a list of occupancies and the loads that have been observed, either by actual weighing or careful analysis, is given below. This list is taken from a report (1925) of the Building Code Committee of the U. S. Department of Commerce on "Minimum Live Loads Allowable for Use in Design of Buildings," further consultation of which is recommended in connection with this subject.

| Occupancy | Observed Loads Per Square Foot of Floor Space |
|--|--|
| Automobile plants: | |
| Machine shop floors | 60 to 200 pounds |
| Ovens | 150 pounds |
| Furnaces | 300 pounds |
| Storage of parts..... | 60 to 345 pounds |
| Automobile tire plants: | |
| Vulcanizers | 175 pounds |
| Furniture factories (domestic): | |
| Woodworking and assembly..... | 100 to 300 pounds |
| Furniture factories (steel furniture): | |
| Fabricating departments | 200 pounds |
| Machine shops | 250 pounds |
| Warehouses, factory | 250 pounds |
| Warehouses, distributors | 300 pounds |

Machine shops:

| | |
|---------------------------------|-------------------|
| Heavy work | 150 to 175 pounds |
| Perfumery works | 40 to 150 pounds |
| Printing and binding: | |
| Heavy pressrooms | 250 to 400 pounds |
| Light presses | 175 pounds |
| Type cases, closely packed..... | 250 pounds |
| Stereotype rooms | 200 to 250 pounds |

Spaces where observed loads were all less than the prescribed minimum have been omitted.

Filing rooms and library stack rooms are likely to produce heavy floor loadings according to a study made by the National Association of Steel Furniture Manufacturers. The loads per square foot of floor space that may be reached by fully loaded filing cabinets vary from 60 pounds to 340 pounds, by safes vary from 200 pounds to 300 pounds, and by library stacks filled with books vary from 80 pounds to 940 pounds.

For ordinary garages in which light, pneumatic-tired vehicles are stored unloaded, a live-load capacity of 125 pounds is adequate. For truck storage the floors should be designed for loads of not less than 175 pounds per square foot. When loaded trucks may be expected to be stored provision should be made for concentrations at any point of not less than 12,000 pounds.

APPENDIX I

Brickwork.

Due to differences in the strength of brick in various sections of the country and the fact that the strength of brickwork is dependent in large part on the strength of the brick, the working stresses specified in § 706-3a, are based on the quality of brick most commonly used in building construction. When brick having a different compressive strength than that assumed are in general use in a municipality, suitable values that may be substituted for those given are shown in the table below. These values are the result of recent studies and tests of brick and brickwork.

| GRADE OF BRICK | ALLOWABLE WORKING STRESSES | | | |
|--|----------------------------|-----------------------|--------------------|-------------|
| | pounds per square inch | | | |
| Average compressive strength in pounds per square inch | Portland Cement Mortar | Natural Cement Mortar | Cement Lime Mortar | Lime Mortar |
| 8,000 plus | 400 | 300 | 300 | 100 |
| 4,500 to 8,000 | 250 | 200 | 200 | 100 |
| 2,500 to 4,500 | 175 | 140 | 140 | 75 |
| 1,500 to 2,500 | 125 | 100 | 100 | 50 |

The values in the table are based on ordinary workmanship. When the masonry is laid with smooth level horizontal joints

Appendix I—J

with completely filled vertical joints, and the work is thoroughly inspected and the effects of eccentric and concentrated loads and lateral forces are fully analyzed and allowance made for them, the working stresses in this table may be increased by fifty per cent. In the case of masonry composed of brick of different grades the allowable working stresses to be used are the values given in the table for the lowest grade of brick of which the masonry is composed.

To determine the values to be used in a given locality the building official should select representative samples, at least five in each case, from the stock of each of the plants supplying brick for use in his municipality, and send them to a reliable testing laboratory to determine their compressive strength. From the information thus obtained, the proper working stresses may be taken from the table.

While the strength of brick is an important factor in the strength of brickwork, the strength of the mortar is also important. Generally speaking, within the working stresses ordinarily used for brickwork, the strength of the masonry is in fairly direct proportion to the strength of the brick. When, however, the strength of the mortar joint has been reached an increase in the strength of the brick does not materially add to the strength of the brickwork.

A third factor of importance is workmanship. This factor, because of its great variability is difficult to evaluate. In the investigation at the U. S. Bureau of Standards, it was found that workmanship "under a definite specification, followed by careful supervision, such as would obtain for a high-class public or private structure, where considerations of cost were more or less subordinate" was likely to produce an increase from 20 to 90 per cent over the strength of brickwork as "generally obtained in commercial construction, where close supervision is not to be expected and the most cogent consideration is economy."

Considering these factors and that the strength of the brick is influenced by the straightness and regularity of shape, and the type of surface of the brick, the thickness of the mortar joints and the rate and degree of absorption of the individual bricks, the working stresses fixed for brickwork should not be taken at more than one-fourth of the average ultimate compressive strength developed for a given set of conditions.

APPENDIX J

Reinforced Concrete.

For the reason that contractors, by and large, are not equipped to control the mixture and strength of concrete, conservative working stresses are prescribed and recommended in § 706-4 of this code. When, however, reinforced concrete construction is

undertaken by competent contractors, thoroughly conversant with the results of the researches of recent years on the nature, possibilities and limitations of concrete, and are fully equipped to produce a material of predetermined strength, permission should be granted them, under the conditions imposed by § 706-1b, to use higher stresses commensurate with the developed ultimate strength at twenty-eight days.

Investigations and experiences of recent years have shown that the strength of concrete is dependent on the amount of water, in U. S. gallons, used in the mixture for each sack (94 lbs.) of cement, referred to as the water-cement ratio. The results will vary somewhat with the materials used and it is well to have tests made for the particular materials to be used. In the absence of such tests the following table will serve as an approximate guide; but the water-cement ratios must not exceed the values there given.

| Water-Cement Ratio U. S. gallons per 94-lb. sack of cement | Volume of Portland Cement to Sum of Separate Volumes of Fine and Coarse Aggregate as Measured Dry | Assumed Compressive Strength at 28 days in pounds per square inch |
|---|---|---|
|---|---|---|

PLASTIC CONCRETE

| | | |
|----|------|-------|
| 8¼ | 1:7 | 1,500 |
| 7½ | 1:6 | 2,000 |
| 6¾ | 1:5¼ | 2,500 |
| 6 | 1:4½ | 3,000 |

MODERATELY WET CONCRETE

| | | |
|----|------|-------|
| 8¼ | 1:6½ | 1,500 |
| 7½ | 1:5½ | 2,000 |
| 6¾ | 1:4¾ | 2,500 |
| 6 | 1:4 | 3,000 |

In interpreting this table, surface water contained in the aggregate must be included as part of the mixing water in computing the water-cement ratio.

When the conditions under which concrete, mixed on the basis of water-cement ratio, are carefully observed, the working stresses in the concrete may be taken at not more than the following percentages of the assumed strength at twenty-eight days; in compression in extreme fiber, forty per cent; in compression in extreme fiber adjacent to supports, forty-five per cent; in direct compression when the loaded member has an area at least twice the area in bearing, twenty-five per cent; in shear in beams with no web reinforcement and without special anchorage of longitudinal steel, two per cent; in shear in beams with no web reinforcement, but with special anchorage of longitudinal steel, three per cent; in shear in beams with web reinforcement but without special anchorage of longitudinal steel, six per cent; in shear in beams with web reinforcement and with special anchorage of longitudinal steel, nine per cent; in shear in flat slabs at a distance from edge of column cap or drop

Appendix J—K

panel equal to the distance of the longitudinal steel from the extreme fiber in compression, three per cent; in shear in footings when longitudinal steel has no special anchorage, two per cent; in shear in footings when longitudinal steel has special anchorage, three per cent; in bond between concrete and steel in beams, slabs and one-way footings, four per cent for plain bars and five per cent for deformed bars; and in bond between concrete and steel in two-way footings, three per cent for plain bars and three and three-quarters per cent for deformed bars.

For vertically reinforced concrete columns the working stresses in the concrete, in pounds per square inch, shall be taken at not less than twenty-two and one-half per cent of the assumed strength of the concrete at twenty-eight days; and the working stresses in the steel, in pounds per square inch, shall be taken at not less than such working stresses in the concrete multiplied by the ratio obtained by dividing the assumed strength of the concrete at twenty-eight days into thirty thousand.

For laterally reinforced columns, the working stresses in pounds per square inch on the cross sectional area of the column within the lateral reinforcement shall be taken at not more than three hundred plus a percentage of the assumed strength of the concrete at twenty-eight days varying uniformly from fourteen per cent when the vertical reinforcement amounts to one per cent of the concrete, to thirty-four per cent when the vertical reinforcement amounts to six per cent.

A type of column that has been used rather extensively for the support of floors over stories that extend below grade, consists of a steel pipe filled with concrete. Unless certain precautions in its manufacture are observed, this column should not be used for any but very light loads, as its strength is no greater than that of the unfilled pipe used as a column. The concrete merely adds somewhat to the stiffness of the column. To secure the benefit in strength that may be provided by the concrete, it is necessary to so place and manipulate the concrete that it attains its maximum density and completely fills the pipe. Only columns filled and fabricated in the shop should be permitted. The unsupported length of such columns should not exceed forty times their diameters.

Further information regarding the design and construction of concrete and reinforced concrete structures can be obtained from the Portland Cement Association at Chicago, Illinois.

APPENDIX K Timber.

For a comprehensive treatment of wood-construction a project of the National Committee on Wood Utilization in the publication of "Wood Construction; Principles—Practice—Details", by Dudley F. Holtman, is recommended. Useful information relating to

lumber and its uses is issued by the National Lumber Manufacturers Association, Washington, D. C., as follows: "House Framing Details", "Maximum Spans for Joists and Rafters", "Heavy Timber Construction Details", and "Strength and Rigidity of Frame Walls". "Manufacturers Association Grading Rules" can also be obtained through this organization. In addition, the Southern Pine Association, New Orleans, La., has issued "Southern Pine Manual"; and the West Coast Lumbermen's Association, Seattle, Wash., has published "Douglas Fir Use Book".

For the convenience of the building official, tables showing the safe loads per square foot of floor surface on wooden joists of various sizes, spacings and spans, and the safe loads uniformly distributed on beams one inch in width for varying spans, are given at the end of this appendix. The calculations are made for common grade on exact sizes for the working stresses given in § 706-7a.

There is also given a table of unit working stresses for columns of the several grades of certain woods for varying ratios of length to least dimension.

The loads given in the tables for joists and beams are the safe gross loads, that is, they include the weight of the construction dependent on them, which must be deducted in order to get the allowable superimposed or live load.

Figures printed in **bold face type** are the loads as limited by the allowable shear with the grain of the wood. They are the maximum safe loads and must not be exceeded.

Figures printed in *italics* are safe loads, but are such as would cause deflections in the joists or beams in excess of one three hundred and sixtieth of the span. Such deflections will cause plastered ceilings to crack. When, therefore, it is important or desirable to avoid this excessive deflection, these loads must be reduced from ten per cent for the shorter spans to as much as thirty-five per cent and more for longer spans.

For the safe load on a beam or girder of a given width the load found in the table for a width of one inch must be multiplied by the width in inches, for the corresponding depth and span, care being taken to use the actual width and not the nominal width.

The loads given in the tables are, furthermore, based on the assumption that the joists or beams are laterally supported, by flooring or otherwise, for their entire lengths. If a beam is unsupported laterally for a distance exceeding twenty times its width, then the allowable load must be reduced from twenty-five to fifty per cent according to the increase in ratio of unsupported length to width from twenty to sixty.

Appendix K

For conditions other than those covered by the tables the safe gross loads may be determined by the following formulas:

For floor loads, using whichever of the two formulas gives the lesser result,

$$w = \frac{4 b d^2 f}{3 L^2 s}$$

$$w = \frac{16 b d v}{L s}$$

For loads on beams or girders, using whichever of the two formulas gives the lesser result,

$$W = \frac{b d^2 f}{9 L}$$

$$W = \frac{4 b d v}{3}$$

For loads which must not be exceeded if the deflection is limited to one three hundred and sixtieth of the span,

$$w = \frac{E b d^3}{675 L^3 s}$$

$$W = \frac{E b d^3}{8100 L^3}$$

When machinery shafting is supported by the wooden joists or beams, the figures in the denominators of the second terms of the formulas should be changed as follows: 675 to 1310, and 8100 to 15725.

The unit working stresses for columns given in § 706-7b, for common grade, are suitable and applicable for ordinary conditions. The allowable loads on columns when lumber of better grades is used, or when, in large building operations, a more exact method of determining such loads for common grade is deemed desirable, may be calculated by the following formulas:

For "intermediate" columns, that is columns in which the ratio of length to diameter or least side $\left(\frac{1}{d}\right)$ does not exceed the constant K, (approximately a ratio of 25 to 30),

$$W = ac \left[1 - \frac{1}{3} \left(\frac{1}{Kd} \right)^4 \right]$$

For "long" columns, that is columns exceeding "intermediate" columns in length,

$$W = \frac{a \pi^2 E}{36 \left(\frac{1}{d} \right)^2} = \frac{0.274 a E}{\left(\frac{1}{d} \right)^2}$$

If the load per square inch is desired divide both sides of the equations by *a*.

In the formulas here given the symbols have the following significance:

- w* is the safe gross load, in pounds per square foot of floor surface, uniformly distributed;
- W* is the safe gross load, in pounds, on the beam or girder, uniformly distributed along its length, or on the column applied centrally;
- a* is the cross-sectional area, in square inches, of the column;
- b* is the width (actual dimension), in inches, of the joist, beam or girder;
- d* is the depth (actual dimension), in inches, of the joist, beam or girder; or the diameter or least side (actual dimension), in inches, of the column;
- L* is the span, in feet, of the joists, beam or girder;
- l* is the unsupported length of the column, in inches;
- s* is the spacing, in inches, center to center of joists;
- f* is the allowable extreme fibre stress, in pounds per square inch;
- v* is the allowable shear with the grain, in pounds per square inch;
- c* is the allowable stress in compression parallel to the grain, in pounds per square inch, for short columns;
- K* is a constant dependent on the modulus of elasticity and the maximum crushing strength parallel to the grain, and is equal to

$$\frac{\pi}{2} \sqrt{\frac{E}{6c}}; \text{ and}$$

E is the modulus of elasticity as follows:

| | |
|-----------|---|
| 1 600 000 | for southern pine and coast region or inland empire douglas fir, |
| 1 400 000 | for west coast hemlock, |
| 1 300 000 | for larch, |
| 1 200 000 | for cypress, redwood, Rocky Mountain region douglas fir, and red, white and Sitka spruce, |
| 1 100 000 | for eastern hemlock, |
| 1 000 000 | for balsam fir, and |
| 800 000 | for Englemann spruce. |

In the following table will be found the necessary data for use in the formulas when timber of a different grade than common is used. The modulus of elasticity for a given species is the same for all grades.

Appendix K

WORKING STRESSES FOR STRUCTURAL LUMBER AND TIMBER

(Recommended by the National Lumber Manufacturers Assn.)

All Sizes, Dry Locations

ALLOWABLE UNIT STRESS IN POUNDS
PER SQUARE INCH

| SPECIES AND GRADE OF TIMBER (other than common grade) | EXTREME FIBRE IN BENDING | | Maximum Hori- zontal Shear | COMPRESSION | |
|--|---|--|-------------------------------------|--|--------------------------------|
| | Joist & Plank Sizes; 4" and less in thickness | Beam & Stringer Sizes; 5" or thicker | | Parallel to grain (short columns) | Perpendi- cular to grain |
| DOUGLAS FIR, COAST REGION | | | | | |
| Dense Super-Structural.. | 2000 | 2000 | 120 | 1466 | 380 |
| Super-Structural and Dense Structural | 1800 | 1800 | 105 | 1300 | 345 |
| Structural | 1600 | 1600 | 90 | 1200 | 345 |
| Common Structural..... | 1200 | 1400 | 84 | 1100 | 325 |
| DOUGLAS FIR, INLAND EMPIRE | | | | | |
| Dense Super-Structural.. | 2000 | 2000 | 120 | 1466 | 380 |
| Dense Structural..... | 1800 | 1800 | 105 | 1300 | 345 |
| No. 1 Common Dimen- sion and Timbers..... | 1135 | 1135 | 70 | 1010 | 315 |
| LARCH, WESTERN | | | | | |
| No. 1 Common Dimen- sion and Timbers..... | 1135 | 1135 | 70 | 1010 | 325 |
| PINE, SOUTHERN YELLOW | | | | | |
| Extra Dense Select' Structural | 2300 | 2300 | 200 | 1600 | 475 |
| Select Structural..... | 2000 | 2000 | 175 | 1450 | 375 |
| Extra Dense Heart..... | 2000 | 2000 | 175 | 1450 | 475 |
| Dense Heart..... | 1800 | 1800 | 150 | 1300 | 375 |
| Structural Square Edge and Sound..... | 1600 | 1600 | 125 | 1200 | 375 |
| No. 1 Common..... | 1200 | 1200 | 100 | 1000 | 325 |
| REDWOOD | | | | | |
| Super-Structural | 2133 | 1707 | 93 | 1422 | 267 |
| Prime Structural..... | 1707 | 1494 | 82 | 1245 | 267 |
| Select Structural..... | 1280 | 1322 | 70 | 1100 | 267 |
| Heart Structural..... | 1024 | 1150 | 56 | 1000 | 267 |

Southern Yellow Pine

Extreme Fiber Stress, (f)—1200 lbs. per square inch

Horizontal Shear, (v)—88 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist. (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|---------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 179 | 123 | 85 | 63 | ... | ... | ... | ... |
| | 16 | 134 | 92 | 64 | ... | ... | ... | ... | ... |
| | 20 | 107 | 74 | 51 | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 227 | 181 | 136 | 100 | 76 | 60 | 49 | ... |
| | 16 | 170 | 136 | 102 | 75 | 57 | ... | ... | ... |
| | 20 | 136 | 109 | 82 | 60 | ... | ... | ... | ... |
| 2 x 12 | 12 | 274 | 220 | 183 | 146 | 112 | 88 | 72 | 59 |
| | 16 | 206 | 165 | 137 | 110 | 84 | 66 | 54 | ... |
| | 20 | 164 | 132 | 110 | 87 | 67 | 53 | ... | ... |
| 3 x 8 | 12 | 288 | 197 | 137 | 100 | 77 | 61 | 49 | ... |
| | 16 | 216 | 148 | 103 | 75 | 58 | ... | ... | ... |
| | 20 | 173 | 118 | 82 | 60 | ... | ... | ... | ... |
| 3 x 10 | 12 | 366 | 293 | 219 | 161 | 124 | 97 | 79 | 65 |
| | 16 | 275 | 220 | 164 | 121 | 93 | 73 | 59 | 49 |
| | 20 | 220 | 176 | 131 | 97 | 74 | 58 | ... | ... |
| 3 x 12 | 12 | 445 | 355 | 296 | 236 | 181 | 143 | 115 | 96 |
| | 16 | 334 | 266 | 222 | 177 | 136 | 107 | 86 | 72 |
| | 20 | 267 | 213 | 178 | 142 | 109 | 86 | 69 | 58 |
| 3 x 14 | 12 | 521 | 416 | 347 | 297 | 249 | 197 | 160 | 132 |
| | 16 | 392 | 312 | 270 | 223 | 187 | 148 | 120 | 99 |
| | 20 | 313 | 250 | 208 | 178 | 149 | 118 | 96 | 79 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|------|------|------|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 405 | 365 | 335 | 310 | 290 | 270 | 250 | 235 | 220 | 210 | 200 |
| 8 | 750 | 680 | 625 | 575 | 535 | 500 | 470 | 440 | 415 | 395 | 375 |
| 10 | 1115 | 1095 | 1005 | 925 | 860 | 800 | 750 | 710 | 670 | 635 | 600 |
| 12 | 1350 | 1350 | 1350 | 1350 | 1260 | 1180 | 1105 | 1040 | 980 | 930 | 885 |
| 14 | 1585 | 1585 | 1585 | 1585 | 1585 | 1585 | 1515 | 1425 | 1350 | 1275 | 1210 |

Appendix K

Douglas Fir, Coast Region

Extreme Fiber Stress, (f)—1200 lbs. per square inch

Horizontal Shear, (v)—72 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 147 | 117 | 85 | 63 | ... | ... | ... | ... |
| | 16 | 110 | 88 | 64 | ... | ... | ... | ... | ... |
| | 20 | 88 | 70 | 51 | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 185 | 148 | 124 | 100 | 76 | 60 | 49 | ... |
| | 16 | 139 | 111 | 93 | 75 | 57 | ... | ... | ... |
| | 20 | 111 | 89 | 74 | 60 | ... | ... | ... | ... |
| 2 x 12 | 12 | 224 | 180 | 150 | 128 | 112 | 88 | 72 | 59 |
| | 16 | 168 | 135 | 113 | 96 | 84 | 66 | 54 | ... |
| | 20 | 134 | 108 | 90 | 77 | 67 | 53 | ... | ... |
| 3 x 8 | 12 | 236 | 189 | 157 | 100 | 77 | 61 | 49 | ... |
| | 16 | 177 | 142 | 103 | 75 | 58 | ... | ... | ... |
| | 20 | 142 | 113 | 82 | 60 | ... | ... | ... | ... |
| 3 x 10 | 12 | 299 | 239 | 200 | 161 | 124 | 97 | 79 | 65 |
| | 16 | 224 | 179 | 150 | 121 | 93 | 73 | 59 | 49 |
| | 20 | 179 | 143 | 120 | 97 | 74 | 58 | ... | ... |
| 3 x 12 | 12 | 364 | 291 | 242 | 208 | 181 | 143 | 115 | 96 |
| | 16 | 273 | 218 | 182 | 156 | 136 | 107 | 86 | 72 |
| | 20 | 218 | 175 | 145 | 125 | 109 | 86 | 69 | 58 |
| 3 x 14 | 12 | 426 | 340 | 284 | 243 | 212 | 189 | 160 | 132 |
| | 16 | 320 | 255 | 213 | 183 | 159 | 142 | 120 | 99 |
| | 20 | 255 | 204 | 170 | 146 | 127 | 113 | 96 | 79 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|------|------|------|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 405 | 365 | 335 | 310 | 290 | 270 | 250 | 235 | 220 | 210 | 200 |
| 8 | 720 | 680 | 625 | 575 | 535 | 500 | 470 | 440 | 415 | 395 | 375 |
| 10 | 910 | 910 | 910 | 910 | 860 | 800 | 750 | 710 | 670 | 635 | 600 |
| 12 | 1100 | 1100 | 1100 | 1100 | 1100 | 1100 | 1100 | 1040 | 980 | 930 | 885 |
| 14 | 1290 | 1290 | 1290 | 1290 | 1290 | 1290 | 1290 | 1290 | 1290 | 1275 | 1210 |

West Coast Hemlock

Extreme Fiber Stress, (f)—1040 lbs. per square inch

Horizontal Shear, (v)—60 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 122 | 97 | 74 | 54 | ... | ... | ... | ... |
| | 16 | 92 | 73 | 56 | ... | ... | ... | ... | ... |
| | 20 | 73 | 40 | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 154 | 123 | 103 | 87 | 66 | 52 | ... | ... |
| | 16 | 116 | 92 | 76 | 66 | 50 | ... | ... | ... |
| | 20 | 92 | 74 | 62 | 52 | ... | ... | ... | ... |
| 2 x 12 | 12 | 187 | 150 | 125 | 107 | 97 | 77 | 62 | 51 |
| | 16 | 141 | 113 | 94 | 80 | 73 | 58 | ... | ... |
| | 20 | 112 | 90 | 75 | 64 | 58 | ... | ... | ... |
| 3 x 8 | 12 | 197 | 157 | 118 | 87 | 67 | 53 | ... | ... |
| | 16 | 148 | 118 | 88 | 66 | 50 | ... | ... | ... |
| | 20 | 118 | 94 | 71 | 52 | ... | ... | ... | ... |
| 3 x 10 | 12 | 249 | 199 | 166 | 140 | 107 | 85 | 69 | 57 |
| | 16 | 187 | 149 | 125 | 105 | 80 | 64 | 52 | .. |
| | 20 | 149 | 119 | 100 | 84 | 64 | ... | ... | ... |
| 3 x 12 | 12 | 303 | 243 | 205 | 173 | 150 | 124 | 100 | 83 |
| | 16 | 227 | 182 | 154 | 130 | 113 | 93 | 75 | 62 |
| | 20 | 182 | 146 | 123 | 103 | 90 | 74 | 60 | 50 |
| 3 x 14 | 12 | 354 | 284 | 236 | 202 | 177 | 157 | 138 | 114 |
| | 16 | 266 | 213 | 177 | 152 | 133 | 118 | 104 | 85 |
| | 20 | 212 | 170 | 142 | 121 | 106 | 94 | 83 | 68 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|------|------|------|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 350 | 320 | 290 | 270 | 250 | 235 | 220 | 205 | 195 | 185 | 175 |
| 8 | 600 | 590 | 540 | 500 | 465 | 430 | 405 | 380 | 360 | 340 | 325 |
| 10 | 760 | 760 | 760 | 760 | 745 | 695 | 650 | 615 | 580 | 550 | 520 |
| 12 | 920 | 920 | 920 | 920 | 920 | 920 | 920 | 900 | 850 | 805 | 765 |
| 14 | 1080 | 1080 | 1080 | 1080 | 1080 | 1080 | 1080 | 1080 | 1080 | 1080 | 1050 |

Appendix K

Larch

Extreme Fiber Stress, (f)—960 lbs. per square inch

Horizontal Shear, (v)—80 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 153 | 97 | 68 | 50 | ... | ... | ... | ... |
| | 16 | 115 | 73 | 51 | ... | ... | ... | ... | ... |
| | 20 | 92 | 58 | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 206 | 157 | 109 | 80 | 61 | ... | ... | ... |
| | 16 | 155 | 118 | 82 | 60 | ... | ... | ... | ... |
| | 20 | 124 | 94 | 65 | 48 | ... | ... | ... | ... |
| 2 x 12 | 12 | 249 | 200 | 159 | 117 | 90 | 71 | 57 | ... |
| | 16 | 187 | 150 | 119 | 88 | 68 | 53 | ... | ... |
| | 20 | 149 | 120 | 95 | 70 | 54 | ... | ... | ... |
| 3 x 8 | 12 | 246 | 158 | 109 | 80 | 62 | 49 | ... | ... |
| | 16 | 185 | 119 | 82 | 60 | ... | ... | ... | ... |
| | 20 | 148 | 94 | 65 | 48 | ... | ... | ... | ... |
| 3 x 10 | 12 | 332 | 253 | 176 | 129 | 99 | 78 | 63 | 52 |
| | 16 | 250 | 190 | 132 | 97 | 74 | 59 | ... | ... |
| | 20 | 199 | 152 | 106 | 77 | 59 | ... | ... | ... |
| 3 x 12 | 12 | 404 | 323 | 256 | 189 | 145 | 114 | 93 | 76 |
| | 16 | 304 | 243 | 192 | 142 | 109 | 86 | 70 | ... |
| | 20 | 242 | 194 | 154 | 113 | 88 | 68 | 56 | ... |
| 3 x 14 | 12 | 473 | 378 | 315 | 261 | 200 | 157 | 128 | 105 |
| | 16 | 356 | 284 | 237 | 196 | 150 | 118 | 96 | 79 |
| | 20 | 284 | 227 | 189 | 157 | 120 | 94 | 77 | 63 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|------|------|-----|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 320 | 290 | 270 | 250 | 230 | 215 | 200 | 190 | 180 | 170 | 160 |
| 8 | 600 | 545 | 500 | 460 | 430 | 400 | 375 | 350 | 335 | 315 | 300 |
| 10 | 965 | 875 | 805 | 740 | 690 | 645 | 605 | 570 | 535 | 505 | 480 |
| 12 | 1230 | 1230 | 1175 | 1085 | 1010 | 940 | 880 | 830 | 785 | 745 | 705 |
| 14 | 1440 | 1440 | 1440 | 1440 | 1390 | 1295 | 1215 | 1145 | 1080 | 1020 | 970 |

Cypress

Extreme Fiber Stress, (f)—1040 lbs. per square inch

Horizontal Shear, (v)—80 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 163 | 106 | 74 | 54 | ... | ... | ... | ... |
| | 16 | 122 | 79 | 56 | ... | ... | ... | ... | ... |
| | 20 | 98 | 62 | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 206 | 165 | 118 | 87 | 66 | 52 | ... | ... |
| | 16 | 155 | 124 | 88 | 65 | 50 | ... | ... | ... |
| | 20 | 124 | 99 | 71 | 52 | ... | ... | ... | ... |
| 2 x 12 | 12 | 249 | 200 | 166 | 127 | 97 | 77 | 62 | 51 |
| | 16 | 187 | 150 | 125 | 95 | 73 | 58 | ... | ... |
| | 20 | 150 | 60 | 100 | 76 | 58 | ... | ... | ... |
| 3 x 8 | 12 | 262 | 171 | 118 | 87 | 67 | 53 | ... | ... |
| | 16 | 198 | 128 | 88 | 66 | 50 | ... | ... | ... |
| | 20 | 157 | 103 | 71 | 52 | ... | ... | ... | ... |
| 3 x 10 | 12 | 332 | 266 | 190 | 140 | 107 | 85 | 69 | 57 |
| | 16 | 249 | 200 | 143 | 105 | 80 | 64 | 52 | ... |
| | 20 | 199 | 160 | 114 | 84 | 64 | ... | ... | ... |
| 3 x 12 | 12 | 404 | 323 | 269 | 204 | 157 | 124 | 100 | 83 |
| | 16 | 303 | 242 | 202 | 153 | 118 | 93 | 75 | 62 |
| | 20 | 242 | 194 | 161 | 122 | 94 | 74 | 60 | 50 |
| 3 x 14 | 12 | 473 | 378 | 315 | 270 | 216 | 170 | 138 | 114 |
| | 16 | 355 | 284 | 236 | 203 | 162 | 127 | 104 | 85 |
| | 20 | 284 | 227 | 189 | 162 | 130 | 102 | 83 | 68 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|------|------|------|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 350 | 320 | 290 | 270 | 250 | 235 | 220 | 205 | 195 | 185 | 175 |
| 8 | 650 | 590 | 540 | 500 | 465 | 430 | 405 | 380 | 360 | 340 | 325 |
| 10 | 1010 | 950 | 870 | 800 | 745 | 695 | 650 | 615 | 580 | 550 | 520 |
| 12 | 1230 | 1230 | 1230 | 1180 | 1090 | 1020 | 960 | 900 | 850 | 805 | 765 |
| 14 | 1440 | 1440 | 1440 | 1440 | 1440 | 1400 | 1315 | 1240 | 1170 | 1110 | 1050 |

Appendix K

Redwood

Extreme Fiber Stress, (f)—960 lbs. per square inch

Horizontal Shear, (v)—56 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 114 | 91 | 68 | 50 | ... | ... | ... | ... |
| | 16 | 85 | 68 | 50 | ... | ... | ... | ... | ... |
| | 20 | 68 | 55 | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 144 | 115 | 96 | 80 | 61 | ... | ... | ... |
| | 16 | 108 | 86 | 72 | 60 | ... | ... | ... | ... |
| | 20 | 86 | 69 | 58 | 48 | ... | ... | ... | ... |
| 2 x 12 | 12 | 175 | 140 | 116 | 100 | 87 | 71 | 57 | ... |
| | 16 | 131 | 105 | 87 | 75 | 65 | 53 | ... | ... |
| | 20 | 105 | 84 | 70 | 60 | 52 | ... | ... | ... |
| 3 x 8 | 12 | 184 | 147 | 109 | 80 | 62 | 49 | ... | ... |
| | 16 | 138 | 110 | 82 | 60 | ... | ... | ... | ... |
| | 20 | 110 | 88 | 65 | 48 | ... | ... | ... | ... |
| 3 x 10 | 12 | 232 | 186 | 155 | 129 | 99 | 78 | 63 | 52 |
| | 16 | 174 | 140 | 116 | 97 | 74 | 59 | ... | ... |
| | 20 | 139 | 112 | 93 | 77 | 59 | ... | ... | ... |
| 3 x 12 | 12 | 284 | 227 | 189 | 162 | 145 | 114 | 93 | 76 |
| | 16 | 213 | 170 | 142 | 121 | 109 | 86 | 70 | 57 |
| | 20 | 171 | 136 | 113 | 97 | 88 | 68 | 56 | ... |
| 3 x 14 | 12 | 331 | 265 | 220 | 189 | 166 | 147 | 128 | 105 |
| | 16 | 248 | 199 | 165 | 142 | 124 | 110 | 96 | 79 |
| | 20 | 199 | 141 | 132 | 113 | 100 | 88 | 77 | 63 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam, ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|------|------|-----|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 320 | 290 | 270 | 250 | 230 | 215 | 200 | 190 | 180 | 170 | 160 |
| 8 | 560 | 545 | 500 | 460 | 430 | 400 | 375 | 350 | 335 | 315 | 300 |
| 10 | 710 | 710 | 710 | 710 | 690 | 645 | 605 | 570 | 535 | 505 | 480 |
| 12 | 860 | 860 | 860 | 860 | 860 | 860 | 860 | 830 | 785 | 745 | 705 |
| 14 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 970 |

Douglas Fir, Rocky Mountain Region Red, White and Sitka Spruce

Extreme Fiber Stress, (f)—880 lbs. per square inch

Horizontal Shear, (v)—68 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 139 | 90 | 62 | ... | ... | ... | ... | ... |
| | 16 | 104 | 68 | ... | ... | ... | ... | ... | ... |
| | 20 | 83 | 54 | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 175 | 140 | 100 | 73 | 56 | ... | ... | ... |
| | 16 | 131 | 105 | 75 | 55 | ... | ... | ... | ... |
| | 20 | 105 | 84 | 60 | ... | ... | ... | ... | ... |
| 2 x 12 | 12 | 212 | 170 | 141 | 107 | 82 | 65 | 53 | ... |
| | 16 | 159 | 128 | 106 | 80 | 62 | 49 | ... | ... |
| | 20 | 127 | 102 | 85 | 64 | 49 | ... | ... | ... |
| 3 x 8 | 12 | 223 | 144 | 100 | 73 | 56 | ... | ... | ... |
| | 16 | 167 | 108 | 75 | 55 | ... | ... | ... | ... |
| | 20 | 134 | 86 | 60 | ... | ... | ... | ... | ... |
| 3 x 10 | 12 | 282 | 226 | 161 | 118 | 91 | 72 | 58 | ... |
| | 16 | 212 | 170 | 120 | 88 | 68 | 54 | ... | ... |
| | 20 | 169 | 136 | 97 | 71 | 55 | ... | ... | ... |
| 3 x 12 | 12 | 344 | 275 | 229 | 173 | 132 | 104 | 85 | 70 |
| | 16 | 258 | 206 | 172 | 130 | 99 | 78 | 64 | ... |
| | 20 | 206 | 165 | 137 | 104 | 79 | 62 | 51 | ... |
| 3 x 14 | 12 | 402 | 322 | 268 | 230 | 183 | 144 | 117 | 97 |
| | 16 | 302 | 242 | 201 | 173 | 137 | 108 | 88 | 73 |
| | 20 | 241 | 193 | 161 | 138 | 110 | 86 | 70 | 58 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|-----|-----|-----|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 295 | 270 | 245 | 225 | 210 | 195 | 185 | 175 | 165 | 155 | 150 |
| 8 | 550 | 500 | 460 | 425 | 390 | 370 | 345 | 325 | 305 | 290 | 275 |
| 10 | 860 | 800 | 735 | 680 | 630 | 590 | 550 | 520 | 490 | 465 | 440 |
| 12 | 1040 | 1040 | 1040 | 1000 | 925 | 865 | 810 | 760 | 720 | 680 | 650 |
| 14 | 1220 | 1220 | 1220 | 1220 | 1220 | 1185 | 1110 | 1050 | 990 | 935 | 890 |

Appendix K

Eastern Hemlock

Extreme Fiber Stress, (f)—880 lbs. per square inch

Horizontal Shear, (v)—56 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 114 | 90 | 62 | ... | ... | ... | ... | ... |
| | 16 | 85 | 68 | ... | ... | ... | ... | ... | ... |
| | 20 | 68 | 54 | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 144 | 115 | 96 | 73 | 56 | ... | ... | ... |
| | 16 | 108 | 86 | 72 | 55 | ... | ... | ... | ... |
| | 20 | 86 | 69 | 58 | ... | ... | ... | ... | ... |
| 2 x 12 | 12 | 175 | 140 | 116 | 100 | 82 | 65 | 53 | ... |
| | 16 | 131 | 105 | 87 | 75 | 62 | 49 | ... | ... |
| | 20 | 105 | 84 | 70 | 60 | 49 | ... | ... | ... |
| 3 x 8 | 12 | 184 | 144 | 100 | 73 | 56 | ... | ... | ... |
| | 16 | 138 | 108 | 75 | 55 | ... | ... | ... | ... |
| | 20 | 110 | 86 | 60 | ... | ... | ... | ... | ... |
| 3 x 10 | 12 | 232 | 186 | 155 | 118 | 91 | 72 | 58 | ... |
| | 16 | 174 | 140 | 116 | 88 | 68 | 54 | ... | ... |
| | 20 | 139 | 112 | 93 | 71 | 55 | ... | ... | ... |
| 3 x 12 | 12 | 284 | 227 | 189 | 162 | 132 | 104 | 85 | 70 |
| | 16 | 213 | 170 | 142 | 121 | 99 | 78 | 64 | 53 |
| | 20 | 171 | 136 | 113 | 97 | 79 | 62 | 51 | ... |
| 3 x 14 | 12 | 331 | 265 | 220 | 189 | 166 | 144 | 117 | 97 |
| | 16 | 248 | 199 | 165 | 142 | 124 | 108 | 86 | 73 |
| | 20 | 199 | 141 | 132 | 113 | 100 | 86 | 70 | 58 |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|------|------|------|-----|-----|-----|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 295 | 270 | 245 | 225 | 210 | 195 | 185 | 175 | 165 | 155 | 150 |
| 8 | 550 | 500 | 460 | 425 | 390 | 370 | 345 | 325 | 305 | 290 | 275 |
| 10 | 710 | 710 | 710 | 680 | 630 | 590 | 550 | 520 | 490 | 465 | 440 |
| 12 | 860 | 860 | 860 | 860 | 860 | 860 | 810 | 760 | 720 | 680 | 650 |
| 14 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 1010 | 990 | 935 | 890 |

Balsam Fir

Extreme Fiber Stress, (f)—720 lbs. per square inch

Horizontal Shear, (v)—56 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 115 | 74 | 51 | ... | ... | ... | ... | ... |
| | 16 | 86 | 55 | ... | ... | ... | ... | ... | ... |
| | 20 | 69 | ... | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 144 | 115 | 81 | 60 | ... | ... | ... | ... |
| | 16 | 108 | 86 | 61 | ... | ... | ... | ... | ... |
| | 20 | 86 | 69 | 49 | ... | ... | ... | ... | ... |
| 2 x 12 | 12 | 175 | 140 | 116 | 88 | 67 | 53 | ... | ... |
| | 16 | 131 | 105 | 87 | 66 | 50 | ... | ... | ... |
| | 20 | 105 | 84 | 70 | 53 | ... | ... | ... | ... |
| 3 x 8 | 12 | 185 | 118 | 82 | 60 | ... | ... | ... | ... |
| | 16 | 139 | 88 | 61 | ... | ... | ... | ... | ... |
| | 20 | 111 | 71 | 49 | ... | ... | ... | ... | ... |
| 3 x 10 | 12 | 232 | 186 | 132 | 97 | 74 | 58 | ... | ... |
| | 16 | 174 | 140 | 99 | 73 | 55 | ... | ... | ... |
| | 20 | 139 | 112 | 79 | 58 | ... | ... | ... | ... |
| 3 x 12 | 12 | 284 | 227 | 189 | 142 | 108 | 86 | 69 | 57 |
| | 16 | 213 | 170 | 142 | 107 | 81 | 65 | 52 | ... |
| | 20 | 171 | 136 | 113 | 85 | 65 | 52 | ... | ... |
| 3 x 14 | 12 | 331 | 265 | 220 | 189 | 149 | 118 | 96 | 79 |
| | 16 | 248 | 199 | 165 | 142 | 112 | 88 | 72 | 59 |
| | 20 | 199 | 141 | 132 | 113 | 89 | 71 | 58 | ... |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam. ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|------|------|-----|-----|-----|-----|-----|-----|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 240 | 220 | 200 | 185 | 170 | 160 | 150 | 140 | 135 | 125 | 120 |
| 8 | 450 | 410 | 375 | 345 | 320 | 300 | 280 | 265 | 250 | 235 | 225 |
| 10 | 710 | 655 | 600 | 555 | 515 | 480 | 450 | 425 | 400 | 380 | 360 |
| 12 | 860 | 860 | 860 | 815 | 755 | 710 | 665 | 625 | 590 | 560 | 530 |
| 14 | 1010 | 1010 | 1010 | 1010 | 1010 | 970 | 910 | 860 | 810 | 765 | 730 |

Appendix K

Englemann Spruce

Extreme Fiber Stress, (f)—600 lbs. per square inch

Horizontal Shear, (v)—56 lbs. per square inch

Safe Loads Per Square Foot Uniformly Distributed

| Size of Joist (nominal) inches | Spacing c. to c. inches | Span in Feet | | | | | | | |
|--------------------------------------|-------------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|
| | | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 2 x 8 | 12 | 96 | 61 | ... | ... | ... | ... | ... | ... |
| | 16 | 72 | 45 | ... | ... | ... | ... | ... | ... |
| | 20 | 58 | ... | ... | ... | ... | ... | ... | ... |
| 2 x 10 | 12 | 144 | 98 | 68 | 50 | ... | ... | ... | ... |
| | 16 | 108 | 73 | 51 | ... | ... | ... | ... | ... |
| | 20 | 86 | 59 | ... | ... | ... | ... | ... | ... |
| 2 x 12 | 12 | 175 | 140 | 99 | 73 | 56 | ... | ... | ... |
| | 16 | 131 | 105 | 74 | 55 | ... | ... | ... | ... |
| | 20 | 105 | 84 | 59 | ... | ... | ... | ... | ... |
| 3 x 8 | 12 | 154 | 98 | 68 | 50 | ... | ... | ... | ... |
| | 16 | 115 | 73 | 51 | ... | ... | ... | ... | ... |
| | 20 | 92 | 59 | ... | ... | ... | ... | ... | ... |
| 3 x 10 | 12 | 232 | 158 | 110 | 81 | 62 | ... | ... | ... |
| | 16 | 174 | 118 | 83 | 61 | ... | ... | ... | ... |
| | 20 | 139 | 95 | 66 | ... | ... | ... | ... | ... |
| 3 x 12 | 12 | 284 | 227 | 161 | 118 | 91 | 71 | 58 | ... |
| | 16 | 213 | 170 | 122 | 89 | 68 | 53 | ... | ... |
| | 20 | 170 | 102 | 97 | 71 | 55 | ... | ... | ... |
| 3 x 14 | 12 | 331 | 265 | 220 | 163 | 125 | 93 | 80 | 65 |
| | 16 | 249 | 198 | 165 | 124 | 94 | 70 | 60 | 49 |
| | 20 | 199 | 159 | 132 | 98 | 75 | 55 | 48 | ... |

Safe Distributed Load in Pounds for Beams One Inch Thick

| Depth of Beam, ins. | Span in Feet | | | | | | | | | | |
|------------------------------|--------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6 | 200 | 185 | 170 | 155 | 145 | 135 | ... | ... | ... | ... | ... |
| 8 | 375 | 340 | 310 | 290 | 270 | 250 | 235 | 220 | 210 | ... | ... |
| 10 | 600 | 550 | 500 | 465 | 430 | 400 | 375 | 355 | 335 | 315 | 300 |
| 12 | 860 | 805 | 735 | 680 | 630 | 590 | 550 | 520 | 490 | 465 | 440 |
| 14 | 1010 | 1010 | 1010 | 935 | 865 | 810 | 760 | 715 | 675 | 640 | 605 |

SAFE LOAD IN POUNDS PER SQUARE INCH ON TIMBER COLUMNS—DRY LOCATIONS

| SPECIES AND GRADE OF TIMBER | RATIO OF LENGTH TO LEAST DIMENSION (l/d) | | | | | | | |
|--|---|------|------|-----|-----|-----|-----|-----|
| | 12 | 16 | 20 | 25 | 30 | 35 | 40 | 50 |
| DOUGLAS FIR, COAST REGION | | | | | | | | |
| Dense Super-Structural..... | 1416 | 1307 | 1079 | 702 | 487 | 358 | 274 | 175 |
| Super-Structural and Dense Structural | 1264 | 1189 | 1027 | 702 | 487 | 358 | 274 | 175 |
| Structural | 1176 | 1112 | 936 | 702 | 487 | 358 | 274 | 175 |
| Common Structural | 1079 | 1032 | 937 | 702 | 487 | 358 | 274 | 175 |
| DOUGLAS FIR, INLAND EMPIRE | | | | | | | | |
| Dense Super-Structural | 1416 | 1307 | 1079 | 702 | 487 | 358 | 274 | 175 |
| Dense Structural | 1264 | 1189 | 1027 | 702 | 487 | 358 | 274 | 175 |
| No. 1 Common Dimension and Timbers | 982 | 943 | 860 | 625 | 457 | 336 | 257 | 164 |
| LARCH, WESTERN | | | | | | | | |
| No. 1 Common Dimension and Timbers | 984 | 933 | 818 | 566 | 396 | 291 | 223 | 142 |
| PINE, SOUTHERN YELLOW | | | | | | | | |
| Extra Dense Heart | 1400 | 1300 | 1065 | 701 | 487 | 358 | 274 | 175 |
| Dense Heart | 1265 | 1190 | 1027 | 701 | 487 | 358 | 274 | 175 |
| Structural Square Edge and Sound | 1174 | 1110 | 984 | 701 | 487 | 358 | 274 | 175 |
| No. 1 Common | 984 | 950 | 880 | 700 | 487 | 358 | 274 | 175 |
| REDWOOD | | | | | | | | |
| Super-Structural | 1339 | 1165 | 822 | 526 | 365 | 268 | 206 | 132 |
| Prime Structural | 1189 | 1073 | 822 | 526 | 365 | 268 | 206 | 132 |
| Select Structural | 1063 | 979 | 807 | 526 | 365 | 268 | 206 | 132 |
| Heart Structural | 972 | 910 | 782 | 526 | 365 | 268 | 206 | 132 |

APPENDIX L Wooden Shingles.

Where it is desired to permit wooden shingles in certain areas of the municipality, Section 1010-1 may be amended to provide for a restricted use of shingles of good grade as follows:

(e). Outside the fire limits, dwellings*, private-garages* and barns, separated by at least twelve feet from other buildings* may be roofed with approved* vertical grain or edge-grain wooden shingles. The combined thickness of each five shingles measured at the butts shall be not less than two inches. The exposure of such wooden shingles to the weather shall not exceed, on roofs greater than one-third pitch, five inches for 16-inch shingles, five and one-half inches for 18-inch shingles, and seven and one-half inches for 24-

inch shingles; nor, on roofs with less than one-third pitch but not less than one-quarter pitch, four inches for 16-inch shingles, four and one-half inches for 18-inch shingles, and six and one-half inches for 24-inch shingles. Such shingles shall be firmly nailed to the roof deck with non-corrodible and rust-resistive nails according to accepted good practice. Unless otherwise specified by ordinance or duly promulgated rules, the American lumber standards established in Simplified Practice Recommendation R 16-29 of the U. S. Department of Commerce, shall be accepted as means of establishing the grade of shingles.

Wooden shingles, due to poor quality and improper construction of the roof, coupled with poor nails causing warped, cupped and loose shingles, and their ignitability under such conditions, have in the past materially aided in the spread of conflagrations. This condition is common in old shingles of most grades used in the past twenty-five years. Any grade of wooden shingles should be prohibited in the fire limits and similar congested areas. Too much importance cannot be placed on proper construction of the roof deck and the quality of nails fastening the shingles to the deck.

APPENDIX M

Protection Against Termites.

In those localities of the United States, generally in the lower latitudes, where danger from termite attacks exists, provision should be made in the building code to guard against the damage caused to wooden construction resulting from such attacks.

As these insects operate entirely under cover, their destruction frequently is not discovered until the infected wooden members have been rendered unsafe. The insects live and propagate underground, and attack wood or fibre products from such sides as may be in contact with the ground. But even at heights of eighteen inches above ground such products are subject to attack. In this latter case, the termites build protective passages of earth and pulverized wood on the faces of masonry supports, or, at times, as self-supporting vertical columns to the underside of the material to be attacked.

Where protection against termites is necessary, the following provisions might appropriately be incorporated in this code as a subdivision of § 809 on Wood Construction.

Protection against termites. (a). No wood or other material into the composition of which cellulose enters in any form, shall be placed in contact with the ground nor within eighteen inches thereof, unless it has been impregnated in an approved* manner with coal tar, creosote or other efficient preservative.

(b). No such wood or other material shall rest upon masonry within four feet of the ground unless there is interposed between it and the masonry a solid continuous layer of cement-mortar* at least one inch thick, or a continuous sheet of non-corrodible metal projecting over and forming a hood along the edges of the masonry.

(c). No such wood or other material within four feet of the ground shall be allowed to come in contact with piping, posts or other objects that extend to or come in contact with the ground, unless such piping, posts or other objects have been fitted with metal shields to block the shelter tubes of termites against extending to such wood or other material.

Fuller information on the habits of these insects and their destructive effects may be had from the U. S. Department of Agriculture, Washington, D. C., and from the College of Agriculture, University of California, Berkeley, California. Circular No. 318, issued August, 1930, by the latter institution, treats the subject fully with helpful recommendations.

APPENDIX N

Footing Design.

The failure to proportion footings according to the pressures they produce on the soil on which they rest, has resulted, in many cases, in uneven settlements in buildings, causing cracked walls, uneven floor levels and other more or less injurious defects, and in some instances, unsafe conditions.

The loads transmitted to the footings vary from time to time, and, except in the case of warehouses and buildings designed for predetermined permanent live loads, floors are seldom fully loaded at any one time. The loads that may be assumed to reach the footings are the live loads remaining when the reductions provided for in § 703-8 are made. By the application of the provisions of § 802-4b the pressures per square foot on the soil under the footings become as nearly uniform as can be reasonably determined.

As an example, taken from actual practice, of the application of this provision let it be assumed that the loads on the lowest columns of a building are as follows:

Group A (representing those columns that carry walls, floors and roof),

| | |
|-------------------------|----------------|
| dead load | 156,250 pounds |
| reduced live load | 99,400 pounds |
| gross load | 255,650 pounds |

Appendix N—O

| | |
|---|---------------|
| Group B (interior columns carrying mostly floors and roof), | |
| dead load | 50,860 pounds |
| reduced live load | 32,670 pounds |
| <hr/> | |
| gross load | 83,530 pounds |
| Group C (interior columns carrying floors only), | |
| dead load | 36,500 pounds |
| reduced live load | 35,500 pounds |
| <hr/> | |
| gross load | 72,000 pounds |

It will also be assumed that the soil on which the footings will rest will carry safely 6,000 pounds per square foot.

On these assumptions the footings must be at least 42.6 square feet under Group A columns ($255,650 \div 6,000$), 13.9 square feet under Group B columns ($83,530 \div 6,000$), and 12.0 square feet under Group C columns ($72,000 \div 6,000$); as "in no case shall the full dead loads plus the reduced live loads on a footing exceed the bearing capacity of the soil."

The column on which the reduced live load constitutes the highest percentage of the gross load, will fix the basis for proportioning the areas of the footings considering dead loads alone. In the case under consideration this is a column of Group C. Dividing the dead load, 36,500 pounds, by the required minimum area of footing, 12 square feet, it is found that 3,042 pounds per square foot is the figure to be used in proportioning the footings.

On this basis the footings should be

51.4 square feet for Group A columns ($156,250 \div 3,042$),
16.7 square feet for Group B columns ($50,860 \div 3,042$), and
12.0 square feet for Group C columns ($36,500 \div 3,042$).

As these footing areas are either equal or larger than those first found, it is evident that in no case has the allowable load on the soil been exceeded.

APPENDIX O

Strength of Floor Fillings.

As a result of an investigation at the Columbia University Testing Laboratories under the auspices of the Manhattan Bureau of Buildings, New York City, the safe live loads on floor-fillings (see definition, § 200) may be determined by the formula given below. Concrete floor slabs having spans in excess of eight feet are to be designed as reinforced concrete (§ 807-4).

$$w' = (da \div S^2) C - w''$$

in which

w' is the safe live load, in pounds per square foot, on the floor,

- w* is the weight, in pounds per square foot, of the floor filling and other permanent parts of the floor construction, such as plastering, hung ceilings, flooring, etc.,
- d* is the depth, in inches, of the steel reinforcement below the top of the slab,
- a* is the cross-sectional area, in square inches, of the steel reinforcement, per foot of width of the slab,
- S* is the span, in feet, of the slab between supports (eight feet or less), and
- C* when 1:2:4 portland cement stone concrete is used, is 16,000 when the reinforcement is not continuous over the supports,
20,000 when the reinforcement consists of rods or other shapes securely hooked over or attached to the supports, and
30,000 when the reinforcement consists of steel fabric continuous over the supports,
- C* when 1:2:5 portland cement cinder concrete is used, is 14,000 when the reinforcement is not continuous over the supports,
18,000 when the reinforcement consists of rods or other shapes securely hooked over or attached to the supports, and
26,000 when the reinforcement consists of steel fabric continuous over the supports.
- For full discussion see Transactions of American Society of Civil Engineers, vol. 79, p. 523.

APPENDIX P

Theatre Curtain Construction.

Theatre fires have demonstrated that to minimize the danger to life from fire or panic, the stage section should be isolated, as completely as possible from the auditorium by a barrier sufficiently substantial to prevent the passage of smoke as well as of flame. Smoke issuing from the stage section into the auditorium is as liable to cause panic as actual flame. The rigid metal curtain is designed to guard against that danger. The following form of construction, used in many modern theatres, or its equivalent in efficiency, should be used.

The curtain shall have a rigid framework of steel. The front or audience side of the frame shall be covered with asbestos cloth or with sheet steel not less than No. 20 U.S. gauge in thickness. The back and edges shall be covered with asbestos cloth or vitrified cellular asbestos boards at least one inch thick. Both

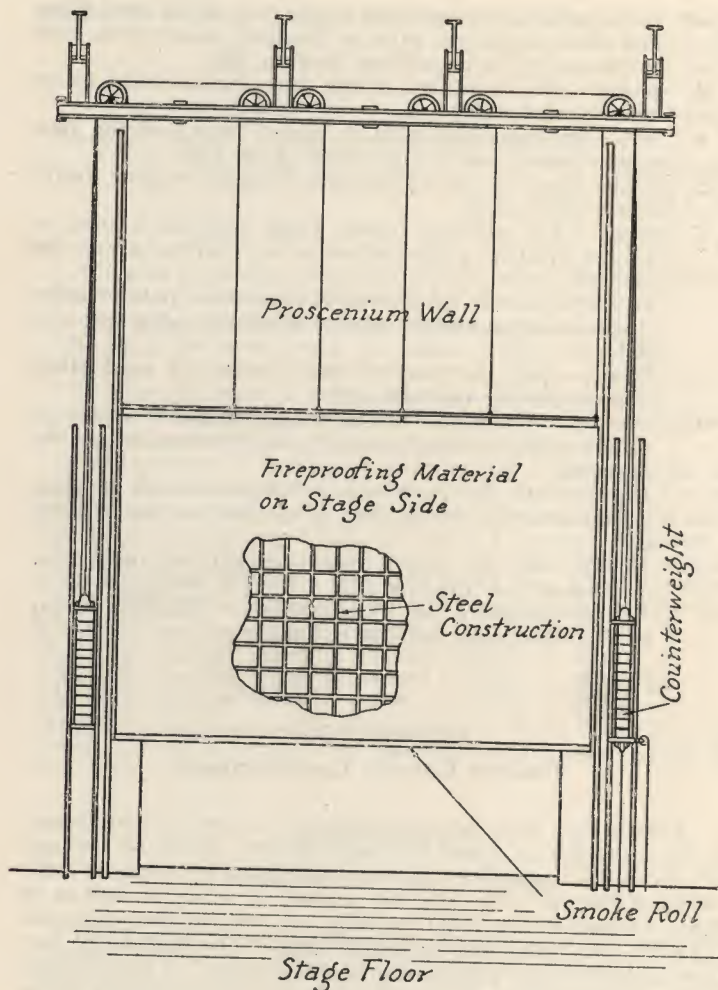


Fig. 15

Diagram of a rigid metal curtain designed to resist a severe stage fire; to entirely prevent the passage of flame from the stage section to the auditorium; and to reduce to a minimum the passage of smoke, § 1301-6a.

coverings shall be securely attached to the framework and the joints properly sealed. (See Fig. 15.) In providing for the required resistance to a ten pound air pressure (§ 1301-6d) the design shall be such that the deflection will not interfere with proper operation of the curtain.

The thickness of the curtain shall be not less than one one hundred and twentieth of the width of the proscenium opening nor less than four inches in any case.

An asbestos roll of a diameter not less than one-half the thickness of the curtain nor less than three inches in any case shall be securely attached to the bottom of the curtain to form a smoke seal between the curtain and the stage floor. (See Fig. 16.)

Detail of Smoke Seal at Bottom of Curtain

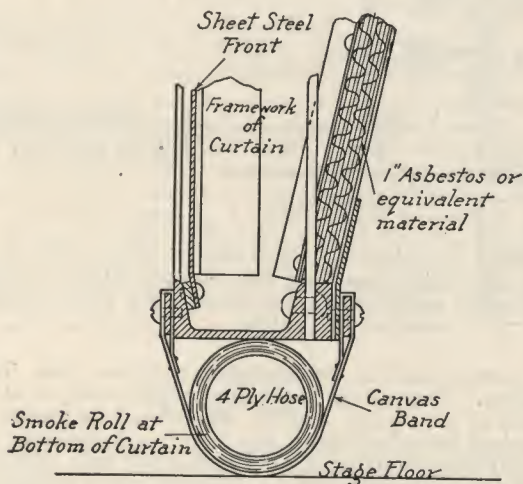
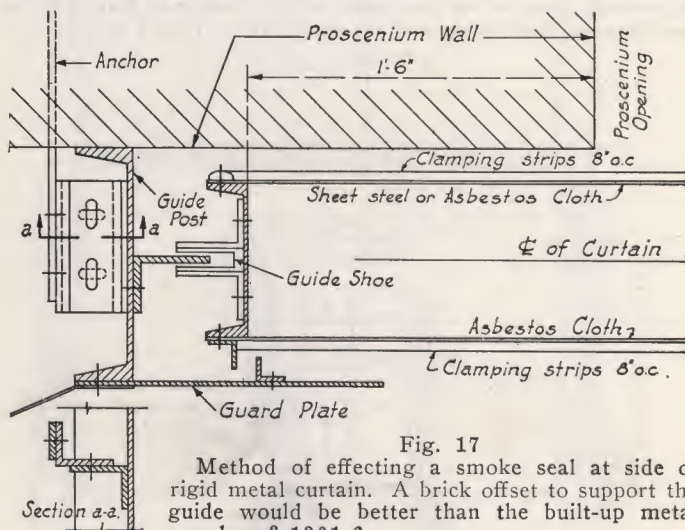


Fig. 16

Method of attaching asbestos smoke roll to effect a seal at bottom of rigid metal curtain, § 1301-6.

Appendix P

The grooves or guide members at the sides of the proscenium opening (§ 1301-6a) shall be rolled steel shapes, and shall be of such design as to form a continuous smoke seal from top to bottom, with a clearance of not over three-eighths inch. The guides shall be installed in such manner that in case of fire on the stage the pressure of heated gases against the curtain will act to close the guide joints tightly. (See Fig. 17.) Provision shall be made to prevent the curtain from getting out of the guiding channels. A smoke seal shall be provided not less than two feet above the proscenium opening for the top of the curtain.



Method of effecting a smoke seal at side of rigid metal curtain. A brick offset to support the guide would be better than the built-up metal member, § 1301-6.

The curtain shall be suspended by not less than four steel lifting cables. Two of the suspension points shall be at the extreme ends of the curtain, and the others shall be placed at such points as best suit the design; but in no case shall the distance between any two points of support exceed ten feet. The hoisting apparatus for the curtain shall be designed with a factor of safety of eight.

The weight of the curtain shall be sufficiently in excess of the counterweights to overcome all friction, so that the curtain will drop freely by gravity. The speed shall be so regulated that the closure of the opening shall be effected within thirty seconds; provided that the last five feet of travel shall require not less than five seconds and the curtain shall settle on the stage floor without shock. Its operation shall be controlled by at least three

heat-actuated releasing devices, of which there shall be one at each side of the proscenium opening near the stage floor, any one of which would release the curtain in case of fire. In addition there shall be an emergency device so arranged that the curtain can be operated by hand from either side of the stage.

Asbestos cloth used for covering the steel framework shall be eighty-five per cent asbestos, metal-reinforced and close woven, weighing not less than two and three-quarter pounds per square yard. It shall be applied in full-width strips continuous from top to bottom of the curtain. The strips shall be double stitched at the seams with metal-reinforced asbestos thread. The metal reinforcement, incorporated in the yarn before weaving, shall consist of monel metal, nickel, brass, chromel, nichrome, or other corrosion resisting metal retaining its strength up to a temperature of 1700 degrees Fahrenheit. After application to the framework the asbestos cloth coverings shall be made smoke tight by filling with a mineral paint having a silicate of soda binder, or with any other paint which will completely fill the pores of the cloth and is equally fire-resistant and will not generate a greater amount of smoke when subjected to heat.

No paint in which oil is used and no combustible material shall be applied or attached to the curtain.

Detailed drawings of such curtains shall be submitted to the building official for his approval before being installed.

The ordinary flexible asbestos curtain does not meet the preceding provisions. Its method of installation is usually such that smoke can pass around the edges. Unreinforced asbestos cloth when subjected to high heat loses strength and is likely to be broken by falling scenery or other causes. For the smaller proscenium openings, however, a lighter steel framework could be used consisting of tubes, structural shapes, bars or rods, having the horizontal members spaced not more than eight feet apart and the vertical members not more than twelve feet apart, and so arranged that there is a separation of the asbestos cloth coverings of at least two inches.

APPENDIX Q

Permit Fees

Local policy regarding the exaction of fees for building permits varies. In some municipalities it is felt that such fees have a deterrent effect on the development of the community. Other municipalities do not find this to be the case. Such fees, however, are justifiable under the police power only as regulatory fees and not as revenue-producing imposts. For the latter purpose special authorization would be necessary.

The fee for a permit to construct a building is quite commonly based on the estimated cost of the building at a given rate per thousand dollars. It is sometimes based on the aggregate

Appendix Q

floor area of the building at a given amount per square foot. A fee of two dollars per thousand dollars of estimated cost is not unusual and, considering the cost of official regulation and supervision is not unreasonable, though in some communities the rate is reduced for buildings whose estimated cost exceeds a given amount. This reduction is made on the reasonable assumption that the municipality's burdens are not directly proportioned to the size of the building but increase at a diminishing rate. As a given amount of attention is necessary in any case, a minimum fee should be fixed; though generally, no fee is exacted for small structures.

When fees for building permits are required, they should not be based on actual costs. Buildings of the same general dimensions, same type of construction, to be occupied in substantially the same manner and located on property of about the same unit value, may vary in actual cost of construction by twenty-five per cent or more, but so far as the general public is concerned the buildings as improvements in the municipality's development are the same. It seems unfair to impose a higher fee on that owner who, because he provides a greater number of conveniences to his tenants or enhances the appearance of the building by the use of a better finish, expends more money in his investment. It is suggested, therefore, that a schedule of unit values on a cubage basis, for various occupancies and types of construction, be formulated by the building official, to be used in estimating the cost of construction in accordance with which the amount of the permit fee would be determined.

The statutory provisions regulating permit fees are sometimes fixed by a separate ordinance, but they may properly be made a part of the building code, in which case they should be incorporated as a subdivision of the section entitled "Permits."

As a suggestion, subject to changes to suit local conditions or policies, the following text is offered:

Fees.

(a). No permit shall be issued until the fee prescribed in this section shall have been paid. Nor shall an amendment to a permit be approved until the additional fee, if any, due to an increase in the estimated cost of the building or structure, shall have been paid.

(b). For a permit for the construction or alteration of a building or structure, the fee shall be at the rate of two dollars per thousand dollars of the estimated cost up to twenty thousand dollars; plus one dollar per thousand dollars of the estimated cost in excess of twenty thousand dollars up to one hundred thousand dollars; plus fifty cents per thousand dollars of the estimated cost in excess of one hundred thousand dollars; but not less than two dollars in any case; provided that no fee shall be required when the estimated cost does not exceed two hundred dollars.

(c). For a permit for the removal of a building or structure from one lot to another, the fee shall be at the rate of two dollars per thousand dollars of the estimated value of the building or structure in its completed condition after removal.

(d). For a permit for the removal of a building or structure to a new location within the same lot, the fee shall be at the rate of two dollars per thousand dollars of the estimated cost of moving, of new foundations and of work necessary to put the building or structure in usable condition in its new location.

(e). For a permit for the demolition of a building or structure the fee shall be at the rate of one dollar for each ten feet in the height of such building or structure plus one per cent additional for each foot of street frontage of the building or structure in excess of fifty feet.

(f). In case of abandonment or discontinuance, the cost of work performed under a permit may be estimated, an adjustment of the fee made and the portion of the fee for incompleted work returned to the permit holder, provided that no refund of a prescribed minimum fee shall be made. If such discontinuance is due to revocation of permit, a similar adjustment and return may be made; provided that no refund shall be made till all penalties incurred or imposed by due authority have been collected. After such a refund has been made no work shall be resumed until a new application has been made and a new permit has been issued.

(g). The term "estimated cost" as used in this section, means the reasonable value of all services, labor, materials, and use of scaffolding, and other appliances or devices entering into and necessary to the prosecution and completion of the work; provided that the cost of excavation or grading, and of painting, decorating or other work that is merely for embellishment or not necessary for the safe and lawful use of the building* or structure*, is not deemed a part of such estimated cost.

APPENDIX R

Additional Powers, Duties and Requirements.

Certain powers, duties and requirements, sometimes included in building codes, have not been incorporated in this code, inasmuch as they are largely dependent for their legality on special legislation by the state. Local policy should determine whether, and to what extent they should be provided for.

Modifications.

The power to vary or modify given provisions of the code cannot, or at least should not be exercised by the building-official

Appendix R

except when such power has been delegated by the state legislature. The authority given the building-official by § 101-5 to promulgate rules is not of this nature; for, it will be noted, that such rule-making power is restricted to the formulation of requirements necessary "for carrying into effect" the statutory provisions, and does not carry with it any authority to modify or set aside any such provisions. If the delegation of power to modify the building code is contemplated the method followed in New York City where the superintendent of buildings is endowed with such authority by a provision in the city charter granted by the state legislature might be followed. The provision, paraphrased to suit this code, is substantially as follows:

The building-official shall have power to vary or modify any provision of this ordinance or of any existing law or ordinance relating to the construction, alteration or removal of buildings or structures erected or to be erected within his jurisdiction, upon an application to him therefor in writing by the owner of a building or structure, or his duly authorized agent, where there are practical difficulties in the way of executing the strict letter of the law, so that the spirit of the law shall be observed and public safety secured and substantial justice done. The particulars of each such application and of the decision thereon shall be entered upon the records of the building-official, and if the application is granted a certificate therefor, together with a statement of the reasons for such decision, shall be issued by him. A record of all such modifications properly indexed under section numbers of this ordinance and open to public inspection, shall be kept at the office of the building-official.

Modifications of this ordinance made under the provisions of this section shall in no manner serve to lower the standards of construction which this ordinance prescribes.

Board of Appeals.

If it should seem better that the power to vary or modify provisions of the code, be vested in a board, rather than an individual, it is still essential that such authority rest on state legislation. Suggestions for suitable legislation follow:

Whenever the building-official shall reject or refuse to approve the mode or manner of construction proposed to be followed, or materials to be used in the erection or alteration of a building or structure, or when it is claimed that the provisions of this ordinance or of any duly adopted rules do not apply, or that an equally good or more desirable form of construction can be employed in a specific case, the owner of such building or structure, or his duly authorized agent, may appeal from the decision of the building-official to the board of appeals which is hereby created.

Such board shall consist of five (or seven) members appointed by the mayor to serve one year or until their

successors are appointed. The mayor shall designate one of the members to serve as chairman. Each member shall be either an architect, civil engineer, builder or superintendent of construction, of not less than ten years' experience as such. Such board shall meet upon notice of the chairman within ten days of the filing of an appeal, unless stated meetings at least twice a month have been established by such board.

Hearings on appeals shall be open to the public. The appellant or his representative, any officer of the municipality and any other person whose interests may be affected by the matter on appeal, shall be given an opportunity to be heard. The concurring vote of four (five, in case the membership is seven) members shall be necessary for the granting of a modification of the ordinance or rules, or for any other decision or determination favorable to the appellant. The failure of such concurring vote shall be deemed to be a confirmation of the judgment of the building-official; provided that the appellant shall be entitled to another hearing, if such failure has been due to the absence of a member of the board. Every action of the board shall be by resolution, copies of which shall be certified to the building-official and the appellant. No member of the board shall pass on any question in which he is personally interested.

Board of Survey.

In § 106-2a the building-official is charged with the duty of directing that a building or structure reported as unsafe shall be "made safe and secure or removed, as may be deemed necessary by him." In the same section the restoration of an unsafe building or structure is prohibited when "the damage or cost of restoration is in excess of fifty per cent of the value of the building or structure." Again, by § 600-3 the building-official may order such means of egress in existing buildings that he may deem necessary, when in his judgment the existing facilities are inadequate for the safety of the occupants. Actions by the building-official under these several provisions may occasion disputes. To avoid possible litigation that may arise from differences of opinion as to the necessity, propriety or reasonableness of orders or directions by the building-official in these matters, provision is sometimes made that such differences be referred to a board of survey, whose decision, unless set aside by a court of record, is binding on the building-official and other parties in interest. In case a board of appeals of which all the members are technical men, has been created such differences might very properly be made the subject of appeal. Otherwise the following provisions might be made.

The owner of a building or structure, or his duly authorized representative, to whom an order of the building-official under § 106 to make safe, secure or remove

Appendix R

such building or structure, or an order under § 600-3 to provide additional means of egress, has been directed, may, if he deems such an order unnecessary, improper or unreasonable, demand the appointment of a board of survey to inspect the building or structure and to confirm, set aside, or modify such order as may seem just and proper in the interest of the safety of the occupants of the building or structure and of the safety of the general public. Such demand must be made in writing within ten days of the service of such orders.

The board of survey shall consist of three persons, one of whom shall be the building-official or a duly appointed assistant, another shall be the owner or an architect, civil engineer or builder designated by him, and the third shall be an architect, civil engineer or builder of not less than ten years' experience as such, chosen jointly by the other two, or, in case of failure to agree, designated by a justice of a court of record. Such board shall make its survey and findings as soon as practicable but not later than ten days after appointment of the first two surveyors, unless such time has been extended by a court of record on application of any member of the board of survey. The findings and determination of any two members of such board shall be set down in writing, and certified copies shall be filed with the building-official and with the owner or his representative, as the determination of the board, which, unless set aside or modified by a court of record, shall be binding on the building-official and all parties in interest.

Registering of Ownership.

When the building-official, as is sometimes the case, is charged with the duty of making periodic inspections after the completion of new buildings to see that lawful conditions are maintained, it is important that he should know the name and address of the owner of each and every premises subject to this requirement within his jurisdiction. This inspection service may perhaps also extend to existing buildings. Provision in the code may then be made as follows:

Every owner of a building, structure or premises which is subject to periodic inspection by the building-official shall file with him his name and the address at which notices or other communications will be received. If such owner is a corporation the names and addresses of its responsible officers shall be given in addition to the name of the owner-corporation.

Such owner may execute and acknowledge a designation in writing of a resident of the municipality as a person who will receive and accept notices or other communications from the building-official relating to the building, structure

or premises in question. Such designation, accompanied by the consent in writing of the person designated and acknowledged by him, shall be filed with the building-official. The designation must specify the residence and place of business of the person making it, and also of the person designated and the location of the property with respect to which the designation is made. It shall remain in force during the period specified therein, if any, or if no period is specified therein, until revoked by the death or legal incompetency of either of the parties or by the filing of a revocation duly acknowledged by either of the parties. While such designation remains in force, a notice of violation, notice to make safe or notice of survey, a summons, a mandate, or any paper or process under the provisions of this ordinance, or any of the same, may be served upon the person so designated, in like manner and with like effect, as if it were served personally upon the person making the designation.

Any occupant of a building, structure or premises who has received, or who may have been served with a notice or other communication from the building-official relating to the building, structure or premises, shall upon receipt of same give immediate notice thereof to the owner or person designated as herein provided.

Enacting and Other Usual Clauses.

The form in which ordinances are introduced into local legislative bodies is generally prescribed either by a general state statute or by the municipality's charter. The language to be used in the enacting clause is usually included in such statute or charter. It may read "The City Council of..... does ordain as follows:"; or, "Be it ordained by the Common Council of.....as follows:"

It is quite usual to include in the ordinance adopting the building code, a general section providing for the repeal of existing ordinances that cover the same subject matter, or that may be inconsistent with its provisions, somewhat as follows:

Ordinances or parts thereof in force at the time that this ordinance shall take effect and inconsistent herewith, are hereby repealed.

It might be well, as is sometimes done, to specify definitely the ordinances or parts of ordinances which are intended to be repealed.

Another clause, intended to prevent the setting aside of the entire code, in case a particular provision is found to be unconstitutional, unreasonable or otherwise invalid, is quite generally added to the general enacting provisions, reading:

Appendix R

The invalidity of any one section or provision of this ordinance shall not invalidate other sections or provisions thereof.

Among the general clauses there is also frequently found the following "Saving Clause."

Nothing in this Code contained shall be construed to affect any suit or proceeding now pending in any court, or any rights acquired, or liability incurred, nor any cause or causes of action accrued or existing, under any act or ordinance repealed hereby. Nor shall any right or remedy of any character be lost, impaired or affected by this ordinance.

Of the general clauses the final one would be that which fixes the time when the ordinance is to become effective. Only in unusual circumstances should a building code, which affects so many interests, and these so extensively, be made to take effect immediately upon enactment. A fair allowance would seem to be sixty days. This should give ample time to complete the development of plans the preparation of which was perhaps begun before the adoption of the code was contemplated or actively discussed, and on which considerable money had already been expended.

This ordinance shall take effect sixty days after its approval by the mayor.

The term "mayor" is used here as representative of the chief executive of the municipality or the official whose approval is required by law to make an ordinance effective. The proper term should be substituted.

INDEX

[References are to Sections.]

A

| | Section |
|--|---------|
| Acoustical Material (see Interior Finish). | |
| Air Duct —For court..... | 506-4b |
| For vent shaft..... | 503-3 |
| Aisle —In place of assembly..... | 1300-2 |
| Live-load | 703-4 |
| Alcove —Limitation | 501-7 |
| Alteration —Application for permit..... | 102 |
| Area limitation | 404-3 |
| Certificate of occupancy..... | 104-2 |
| Compliance with code..... | 100-4 |
| Definition | 200 |
| Display sign | 1801 |
| Height limitation | 403-2 |
| Sidewalk shed, when required..... | 902-1 |
| To exit facilities..... | 600-2 |
| To light and ventilation..... | 500-2 |
| To street encroachments | 405-7 |
| Within fire limits..... | 401-3 |
| Amusement Device —Certificate | 1405 |
| Definition | 200 |
| Inspection | 1406 |
| Operation | 1408 |
| Repairs | 1401 |
| Repair, notice of..... | 1406-2 |
| Safeguards | 1404 |
| Amusement Park —Fire extinguishing equipment.... | 1704 |
| Apartment —Definition | 200 |
| Exits required | 602-4 |
| Apartment House (see multifamily house). | |
| Appeals (Appendix R). | |
| Application for Permit —Amendments..... | 102-5 |
| Approval —Materials, appliances, or methods of construction | 701 |
| Approved —Definition | 200 |

Index

| | Section |
|--|----------|
| Approved Masonry (see also masonry)—Definition.. | 200 |
| Area—Construction | 810-1 |
| Definition (dimension) | 200 |
| Definition (structure) | 200 |
| Outside of building line..... | 405-4k |
| Area of Building—Limitation | 404 |
| Modification | 404-9 |
| Ashlar—Construction | 806-6 |
| Ash Pit—Fire protection..... | 1207 |
| Asylum—To be fireproof | 402-2 |
| Automatic—Definition | 200 |
| Automatic Sprinklers—Construction | 1702-3 |
| Definition of sprinklered..... | 200 |
| Effect on area of building..... | 404-9 |
| Fire department connection..... | 1702-5 |
| Gate valves | 1702-4 |
| Inspected appliances (Appendix B). | |
| Sprinklers | 1702-2 |
| Water supply | 1702-6 |
| When required | 1702-1 |
| Automobile Salesroom (see note under definition of Garage). | |
| Awning—Limitation | 405-4i |
| B | |
| Balconies—Limitation | 405-4j |
| Within fire limits..... | 401-6f |
| Basement—Definition | 200 |
| When not a story..... | 403-8b |
| Bathroom—Light and ventilation..... | 501-5 |
| Window area required..... | 502-1 |
| Bay Window—Construction | 810-3 |
| Beams and Girders—In fireproof construction..... | 1002-4e |
| In semifireproof construction | 1003-2 |
| In slow-burning construction | 1004-3 |
| In wooden construction | 809-1, 2 |
| Steel | 808-5 |
| Templates | 808-11 |
| Bearing Wall—Definition | 200 |

Index

| | Section |
|--|---------|
| Billboard (see display sign). | |
| Boiler Room—Exits required..... | 602-7 |
| Separation | 1211 |
| Bolting—In wooden construction..... | 809-4 |
| Steel, when permitted..... | 808-7 |
| Brickwork (see also masonry). | |
| Bond | 806-3 |
| Strength (Appendix I). | |
| Use of underburned bricks..... | 806-3c |
| Builder's Shanty—Within fire limits..... | 401-6e |
| Building—Alteration to conform..... | 100-4b |
| Application for permit..... | 102-1 |
| Area limitation | 404 |
| Certificate of occupancy..... | 104-2 |
| Change of occupancy..... | 104-7 |
| Classification as to construction..... | 301 |
| Classification of occupancies..... | 300 |
| Definition | 200 |
| Doubtful classification | 300-3 |
| Existing, completion of..... | 102-7 |
| Exits required | 600 |
| Floor capacities to be posted..... | 705 |
| Frame construction in rows..... | 809-6i |
| Height defined | 200 |
| Height limitation | 403 |
| Light and ventilation..... | 500 |
| Location, when restricted..... | 406 |
| Maintenance | 100-5 |
| Mixed occupancy | 300-2 |
| New, to conform..... | 100-4 |
| Sidewalk shed, when required..... | 902-1 |
| To be enclosed..... | 805 |
| To be kept in repair..... | 810-12 |
| Unsafe | 106 |
| Use and maintenance..... | 100-5 |
| Within fire limits..... | 401 |
| Building Code—Buildings affected..... | 100-6 |
| Conformance with code..... | 100-4 |
| Enacting and other clauses (Appendix R). | |
| How construed | 100-3 |
| Modifications (Appendix R). | |

Index

| | Section |
|--|---------|
| Building Code —Matter covered | 100-2 |
| Ordinance remedial | 100-3 |
| Scope | 100 |
| Short title | 101-1 |
| Building Line —Definition | 200 |
| Building Material —Accepted for fireproofing purposes | 1000-1b |
| Approvals | 701-4 |
| Assumed weights | 702 |
| Fire resistance, how determined..... | 1000-1a |
| Inspected appliances (Appendix B). | |
| New, investigation | 701-2 |
| Prompt removal after completion..... | 914 |
| Quality | 700 |
| Standard specifications, American Society for Testing Materials (Appendix E). | |
| Storage during construction..... | 913 |
| Tests | 701 |
| Warning lights | 915 |
| Building Official —Absence or disability..... | 101-1c |
| Additional powers and duties (Appendix R). | |
| Appointment | 101-1 |
| Cooperation of other officials..... | 101-8 |
| Definition | 200 |
| Duties | 101-3 |
| Inspections | 101-4 |
| Notice of commencement of work..... | 103-7c |
| Qualifications | 101-2 |
| Records | 101-6 |
| Reports | 101-7 |
| Right of entry..... | 101-9 |
| Rules | 101-5 |
| Bulkhead —Construction | 1011-2 |
| Definition | 200 |
| Business-Building —Area limitation | 404-5 |
| Definition | 200 |
| Height limitation | 403-6 |
| Height limitation exception | 403-8c |
| Light and ventilation..... | 501-2 |

C

| | Section |
|--|---------|
| Cast Iron—Working stresses..... | 706-6 |
| Ceilings—In cellars | 810-8 |
| In multifamily houses..... | 810-7 |
| Cellar—Ceiling construction | 810-8 |
| Definition | 200 |
| Drainage | 810-10 |
| Floor construction | 810-9 |
| Light and ventilation..... | 501-10 |
| Partition construction | 810-6 |
| Regarded as story (see definition)..... | 200 |
| When not a story..... | 403-8b |
| Cement Lime Mortar—Definition..... | 200 |
| Cement Mortar—Definition | 200 |
| Certificate—Amusement device | 1405 |
| Electrical work | 1603 |
| Elevator | 1405 |
| For installations | 105-2 |
| For structures | 105-1 |
| Gas-piping | 1501-3 |
| Plumbing | 1502-7 |
| Certificate of Occupancy—Alteration..... | 104-2 |
| Contents | 104-3 |
| Existing buildings | 104-6 |
| Issuance and filing..... | 104-5 |
| New buildings | 104-1 |
| Plumbing certificate required | 1502-7 |
| Temporary | 104-4 |
| Chases—Restriction | 806-13 |
| Chimney—Construction | 1100-1 |
| Cupola | 1102 |
| Fireplaces | 1100-11 |
| Flue construction | 1100 |
| Metal stacks | 1101 |
| Raising adjoining chimneys..... | 1103 |
| Supports | 1100-1 |
| To be kept safe..... | 1100-1g |
| Cinder Blocks (see hollow blocks). | |

Index

| | Section |
|--|---------|
| Classification—According to construction..... | 301 |
| According to occupancy..... | 300 |
| Doubtful | 300-3 |
| Mixed occupancy | 300-2 |
| Coal Tipples—Within fire limits..... | 401-6g |
| Columns—Bases for steel columns..... | 808-4 |
| Cast iron | 808-2 |
| Cast iron | 706-6 |
| Columns—In fireproof construction..... | 1002-4 |
| In semifireproof construction | 1003-2 |
| In heavy timber construction..... | 1004-2 |
| In wooden construction..... | 809-3 |
| Reinforced concrete | 706-4 |
| Steel | 808-3 |
| Steel, capacity | 706-5 |
| Wood | 809-3 |
| Wood, capacity | 706-7b |
| Concrete—Definition | 200 |
| In reinforced concrete..... | 807-2 |
| Working stresses | 706-3 |
| Concrete Blocks (see hollow blocks). | |
| Construction Hoist—Interior | 904-1 |
| Exterior | 904-2 |
| Machinery | 904-4 |
| Construction Safeguards—Cellar drainage | 916 |
| Demolition | 920 |
| Disposal of waste..... | 914 |
| Fire protection | 909 |
| Floor openings, protection..... | 906 |
| Hoist | 904 |
| Ladders | 908-2 |
| Lighting | 917 |
| Personal injury | 919 |
| Protection of roof and skylights..... | 907 |
| Sanitation | 918 |
| Scaffolds | 901 |
| Sidewalk sheds | 902 |
| Stair facilities | 908 |
| Storage of material..... | 913 |

Index

| | Section |
|---|---------------|
| Construction Safeguards—Temporary fence..... | 903 |
| Temporary heaters | 910-2 |
| Warning lights | 915 |
| Watchman | 912 |
| Welding and cutting..... | 911 |
| Conveyors—Dust, stock and refuse..... | 1204-9 |
| Cornice—Construction | 1010-3 |
| Limitation | 405-4 |
| Corporation Counsel—Definition | 200 |
| Corridor—Light and ventilation..... | 501-8 |
| Court—Accessibility | 506-7 |
| Area | 506-2 |
| Concrete pavement | 506-6 |
| Definition | 200 |
| Drainage | 506-6 |
| Height defined | 200 |
| Intakes | 506-4 |
| Live-load | 703-7 |
| To be unobstructed..... | 506-5 |
| Width | 506-1 |
| Width defined | 200 |
| Cupola Chimney—Construction | 1102 |
| Curb Level—Definition | 200 |
| Definition (re buildings)..... | 200 |
| Definition (re excavation)..... | 200 |
| Curtain—In place of assembly..... | 1301-6 |
| Theatre curtain construction (Appendix P). | |

D

| | |
|--|--------------|
| Dead Load (see also load)—Definition..... | 200 |
| Definitions—Hyphenated terms | 200-c |
| Significance of asterisk..... | 200-c |
| Demolition—Application for permit..... | 102-1 |
| Chutes | 920-2 |
| Permit necessary | 102-1 |
| Procedure | 920-1 |
| Sidewalk shed, when required..... | 902-1 |
| Sprinkling | 920-3 |

Index

| | Section |
|--|---------|
| Detention Building—To be fireproof..... | 402-2 |
| Display-Sign—Alterations | 1801 |
| Bond, when required..... | 1804 |
| Construction | 1803 |
| Definition | 200 |
| Existing signs | 1802 |
| Illumination | 1803-7 |
| Location restricted | 1803-5 |
| Permit required | 1800-1 |
| Stability | 1803-6 |
| When exempted | 1800-2 |
| Within fire limits | 401-6i |
| Doors—Fastenings | 610-4 |
| Hanging | 610-2 |
| In fire partitions..... | 1006-3 |
| In firewalls | 1005-2 |
| In stairway enclosures..... | 604-2d |
| Projection beyond street line..... | 405-4g |
| Revolving door | 610-3 |
| When fire protection required..... | 1008-1 |
| Width | 610-1 |
| Dormer—Construction | 1011-6 |
| In fireproof construction..... | 1002-5g |
| Drainage—Cellar | 810-10 |
| Courts | 506-6 |
| During construction | 916 |
| Dressing Room—Connected with stage..... | 1301-5 |
| Shelving | 1301-10 |
| Drying Room—Fire protection..... | 1205 |
| Duct (see also air duct)—In forced draft systems.... | 1204-2 |
| Dwelling (see also residence-building)—Definition... | 200 |
| Height limitation | 403-5 |

E

| | |
|-------------------------------------|--------|
| Earthquakes (Appendix G). | |
| Egress (see exit facilities). | |
| Electric Equipment—Appliances | 1601-3 |
| Certificate | 1603 |
| Inspection | 1602 |

| | Section |
|--|---------|
| Electric Equipment—Installation | 1600-1 |
| Methods and practice..... | 1601 |
| National Electrical Code..... | 1601-2 |
| Portable appliances | 1201-4 |
| Stage in places of assembly..... | 1301-12 |
| Supplying current | 1604 |
| Elevator—Accidents | 1407 |
| Amusement devices | 1404 |
| Carrying capacity | 1402-1 |
| Certificate required | 1405 |
| Definition | 200 |
| Design | 1402 |
| Dumbwaiters excepted | 1400-2 |
| Inspection | 1406 |
| Installation | 1400-1 |
| Lighting | 1402-6 |
| Machinery compartment enclosure..... | 1009-7 |
| Number in shaftway limited..... | 1009-8 |
| Operation | 1408 |
| Repairs | 1401 |
| Repairs, notice of..... | 1406-2 |
| Riding on freight elevators restricted..... | 1403 |
| Safety devices | 1402 |
| To be kept in readiness for fire department..... | 1409 |
| Use during construction..... | 904-3 |
| Encroachments (see street encroachments). | |
| Excavation—Protection | 801-1 |
| Support of neighboring walls..... | 801-2 |
| Warning lights | 915 |
| Existing Building (see building). | |
| Exit Facilities—Alterations | 600-2 |
| Apartments | 602-4 |
| Boiler rooms | 602-7 |
| Doorways | 610 |
| Existing buildings | 600-3 |
| Exit signs | 611-2 |
| Exterior stairways and fire escapes..... | 607 |
| Fire tower, construction..... | 605 |
| Fire tower, when required..... | 602-6 |
| Hallways | 609 |

Index

| | Section |
|---|---------------|
| Exit Facilities—Horizontal exits | 606 |
| Interior stairway | 604 |
| Kinds of exits..... | 601-1 |
| Lighting | 611-3 |
| Location in buildings..... | 603 |
| Maintenance | 611 |
| Multifamily houses | 602-4 |
| New buildings | 600-1 |
| Number required | 602 |
| Passageway | 608 |
| Places of assembly..... | 602-5 |
| Proportioned to occupants..... | 601-2 |
| To be kept clear..... | 611-4 |
| Exterior Openings (see door and window). | |
| F | |
| Fan—Forced draft system | 1204-3 |
| Fees—Building permit (Appendix Q). | |
| Fence—Temporary, when required | 903 |
| Within fire limits..... | 401-6h |
| Fire Escape—Construction | 607-7 |
| Egress from | 607-7e |
| Limitation | 405-4j |
| Location | 607-7c |
| Terminus | 607-7d |
| Use limited to existing buildings..... | 600-3 |
| Fire Extinguishing Equipment—Automatic sprinklers 1702 | |
| During construction | 909 |
| Elevator to be in readiness..... | 1409 |
| In amusement parks..... | 1704 |
| Installation | 1700 |
| Location of outside connection..... | 405-4m |
| Special construction, high buildings..... | 1703 |
| Standpipes | 1701 |
| Fire Limits—Alterations | 401-3 |
| Definition | 200 |
| Districts established | 401-1 |
| Exceptions | 401-6 |
| Garages and stables..... | 401-6a |

Index

| | Section |
|--|---------|
| Fire Limits —Limitations within..... | 401-2 |
| Restriction against moving buildings..... | 401-1 |
| Fire Partition —Construction | 1006-1 |
| Definition | 200 |
| In buildings of slow-burning and ordinary construction | 1006-2 |
| Openings | 1006-3 |
| Fireplace —Construction | 1100-11 |
| Fire Prevention (see Fire Protection). | |
| Fireproof Construction —Acceptable forms..... | 1002-1 |
| Area limitation | 404-4 |
| Beams and girders..... | 1002-4 |
| Bulkhead | 1011-2 |
| Columns | 1002-4 |
| Definition | 200 |
| Fire test data (Appendix D). | |
| Floor-filling defined | 200 |
| Floors and roofs..... | 1002-5 |
| Interior finish | 1002-7 |
| Lintels | 1002-4 |
| Mansards | 1002-5g |
| Partitions | 1002-6 |
| Pipes prohibited in fireproofing..... | 1002-4h |
| Protection of steel..... | 1002-4 |
| Reinforced concrete | 1002-3 |
| Rigid connections in steel required..... | 1002-4i |
| Trusses | 1002-4g |
| When required | 402 |
| Fire Protection —Approved appliances..... | 1000-2 |
| Columns carrying walls, non-fireproof buildings. | 808-13 |
| During construction | 909 |
| Existing shaftways | 1009-9 |
| Exterior openings | 1008 |
| Heat appliances | 1201 |
| Inspected appliances (Appendix B). | |
| Required fire resistance..... | 1001 |
| Roofs | 1010 |
| Shafts | 1009 |
| Standard fire tests (Appendix C). | |
| Wooden construction | 809-5 |

Index

| | Section |
|---|---------|
| Fire Resistive Construction (see note under definition of Fireproof Construction). | |
| Fire Safe Construction (see note under definition of Semifireproof Construction). | |
| Firestopping —For pipes, shafting, belts and conveyors | 1007-7 |
| In exterior walls | 1007-5 |
| In furred walls | 1007-2 |
| In partitions | 1007-4 |
| In stairways | 1007-6 |
| In studded off spaces..... | 1007-3 |
| Inspection | 1007-8 |
| Fire Tower —Construction | 605 |
| When required | 602-6 |
| Firewall —Construction | 1005-1 |
| Definition | 200 |
| Openings permitted | 1005-2 |
| Thickness | 1005-1 |
| When required | 404-2 |
| Floor Area —Definition | 200 |
| Floor Filling —Definition | 200 |
| In fireproof construction..... | 1002-5 |
| Strength (Appendix O). | |
| Flooring —In fireproof construction..... | 1002-7 |
| Temporary during construction..... | 905 |
| Wood, linoleum, rubber, tile or cork..... | 1002-7b |
| Floor Light —Construction | 810-2 |
| Floor Openings —Protection during construction.... | 906 |
| Floors —In fireproof construction..... | 1002-5 |
| In semifireproof construction | 1003-3 |
| In slow-burning construction | 1004-4 |
| Flue (see also chimney). | |
| Construction, high heat appliances..... | 1100-6 |
| Construction, low heat appliances..... | 1100-4 |
| Construction, medium heat appliances..... | 1100-5 |
| For gas appliances | 1105-2 |
| For incinerators | 1100-7 |
| Linings | 1100-3 |
| Required flues | 1100-2 |

Index

| | Section |
|--|---------|
| Flue—Restricted use | 1100-9 |
| Size | 1100-8 |
| To be cleaned..... | 1100-10 |
| Footing (see also foundation)—Design | 802-4 |
| Steel grillage | 802-2 |
| When wood permitted..... | 802-2a |
| Forced Draft System—Ducts | 1204-2 |
| Dust, stock and refuse conveyors..... | 1204-9 |
| Fans | 1204-3 |
| Grounding | 1204-5 |
| Heating, cooling and ventilating systems..... | 1204-7 |
| Installation | 1204-1 |
| Power transmission | 1204-4 |
| Removal of flammable vapors..... | 1204-8 |
| Foundation (see also footing)—Design | 802-4 |
| Footing design (Appendix N). | |
| Minimum depth | 802-1 |
| Piles | 802-5 |
| Pressure under footings..... | 802-3 |
| Foundation Wall—Definition | 200 |
| Materials | 803-1 |
| Thickness | 803-2 |
| Frame Construction (see also wooden construction). | |
| Area limitation | 404-8 |
| Definition | 200 |
| Erection | 809-6 |
| Height limitation | 403 |
| Walls between dwellings in rows..... | 809-6i |
| Walls near lot lines..... | 809-6g |
| Walls near other buildings..... | 809-6h |
| Freight Elevator (see elevator). | |
| Fresh Air Inlet—Location | 405-4m |
| Fully Protected Construction (see note under definition of Fireproof Construction). | |

G

| | |
|---|-------------|
| Gallery—Seat arrangement | 1300-3 |
| Garage (see also storage-building)—Area limitation.. | 404-4, 5, 6 |
| Combined with other occupancies..... | 1304 |
| Definition | 200 |
| Within fire limits..... | 401-6a |

Index

| | Section |
|--|---------|
| Gas Appliances—Flue connections | 1105 |
| Flues or outlet pipes..... | 1105-2 |
| Installation | 1105-3 |
| Portable | 1201-4 |
| Gas Cutting—Requirements | 808-9 |
| Safeguards during construction..... | 911 |
| Gas Piping—Certificate | 1501-3 |
| Existing work | 1501-5 |
| Inspection | 1501-2 |
| Installation | 1501-1 |
| Supplying gas | 1501-4 |
| Girders (see beams). | |
| Grade—Definition | 200 |
| Grandstand (see place of assembly). | |
| Greenhouse—Within fire limits..... | 401-6c |
| Gutter—Construction | 1010-4 |
| Gypsum Mortar—Definition | 200 |
| H | |
| Habitable Room—Alcoves | 501-7 |
| Alteration restricted | 500-2 |
| Below grade | 501-10 |
| Definition | 200 |
| Light and ventilation..... | 501-1 |
| Size | 501 |
| Window area required..... | 502-2a |
| Windows required | 501-1a |
| Hall (see corridor). | |
| Hallway (see also passageway)—Live-load..... | 703-4 |
| Width | 609 |
| Hangar—Classification (see definition of Storage Building). | |
| Heat Appliance—Classification | 1200 |
| Heat Appliances—Drying rooms | 1205 |
| Fire protection | 1201 |
| Flues for | 1100 |
| Hoods | 1203 |
| Mounting and clearances..... | 1201 |
| Non-conforming installations | 1201-5 |
| Smoke pipes | 1202 |

| | Section |
|---|---------|
| Heating—Permanent heat | 910-1 |
| Temporary heat | 910-2 |
| Heating System—Cold air ducts..... | 1208-4 |
| Forced draft | 1204-7 |
| Registers | 1209 |
| Steam and hot water pipes..... | 1210 |
| Warm air pipes..... | 1208 |
| Heavy Timber Construction—Area limitation..... | 404-6 |
| Beams and girders..... | 1004-3 |
| Columns | 1004-2 |
| Definition | 200 |
| Dry rot | 1004-7 |
| Floors | 1004-4 |
| Height limitation | 403 |
| Lintels | 1004-3 |
| Power drives | 1004-6 |
| Roofs | 1004-5 |
| Walls | 1004-1 |
| Height—Definition (re building)..... | 200 |
| Definition (re court) | 200 |
| Definition (re story) | 200 |
| Definition (re wall) | 200 |
| Features not included..... | 403-8 |
| Limitations | 403 |
| Hoist (see construction hoist). | |
| Hollow Block—Definition | 200 |
| Masonry | 806-5 |
| Restriction of use..... | 806-5g |
| Horizontal Exit—Construction and arrangement..... | 606 |
| Hospital—To be fireproof..... | 402-2 |

I

| | |
|---|--------|
| Ice Houses—Within fire limits..... | 401-6g |
| Incinerator—Construction, non-fuel fired..... | 1206-2 |
| Construction, fuel fired..... | 1206-3 |
| Flues | 1100-6 |
| Installation | 1206-1 |

Index

| | Section |
|---|---------|
| Inspection (see also building official). | |
| Amusement device | 1406 |
| By building official..... | 101-4 |
| Electrical work | 1602 |
| Elevator | 1406 |
| Firestopping | 1007-8 |
| Gas-piping | 1501-2 |
| Institutional Building—Area limitation..... | 404 |
| Definition | 200 |
| Height limitation | 403-4 |
| Light and ventilation..... | 501-4 |
| Lighting | 501-4 |
| Stairways and corridors to be ventilated..... | 501-8 |
| Intake (see air duct). | |
| Interior Finish—Acoustical material in fireproof construction | 1002-7e |
| In fireproof construction | 1002-7 |
| In semifireproof construction..... | 1003-5 |
| Wooden wainscoting in fireproof construction... | 1002-7d |
| J | |
| Jail—To be fireproof..... | 402-2 |
| Joists—Steel | 1003-3c |
| Strength of wooden joists (Appendix K). | |
| Wooden | 809-1 |
| L | |
| Ladders—Use | 908-2 |
| Leader—Construction | 1010-4 |
| Light and Ventilation—Alterations..... | 500-2 |
| Bathrooms and water-closets..... | 501-5 |
| Business and workrooms..... | 501-2 |
| Cellar | 501-10 |
| Courts | 506 |
| Institutional buildings | 501-4 |
| Mechanical ventilation | 505 |
| New buildings | 500-1 |
| Public buildings | 501-3 |
| Rooms | 501-1 |

| | Section |
|---|----------------|
| Light and Ventilation—Rooms below grade..... | 501-10 |
| Rooms needing special devices..... | 501-9 |
| Service pantries and storerooms..... | 501-6 |
| Stairways and corridors..... | 501-8 |
| Ventilating skylights | 504 |
| Vent shafts | 503 |
| Windows | 502 |
| Lighting—Exit facilities | 611-3 |
| Protection to | 1500-2 |
| When required | 1500-1 |
| Lime Mortar—Definition | 200 |
| Lintels—In fireproof construction..... | 1002-4f |
| In semifireproof construction | 1003-2d |
| In heavy timber construction..... | 1004-3c |
| Steel | 808-5 |
| Templates | 808-11 |
| Live-Load (see also load)—Definition..... | 200 |
| Load—Assumed live-load | 703-2 |
| Concentration | 703-3 |
| Court and yard..... | 703-7 |
| Dead-load defined | 200 |
| Floor loads, various occupancies (Appendix H). | |
| Live-load defined | 200 |
| Permissible loads to be posted..... | 705 |
| Permissible reduction in live-loads..... | 703-8 |
| Roof | 703-5 |
| Sidewalk | 703-6 |
| Stairway and passageway..... | 703-4 |
| Temporary support | 703-1b |
| To be kept within floor capacities..... | 705-3 |
| Wind | 704 |
| Lot—Definition | 200 |
| Diminution restricted | 103-4c |

M

| | |
|-----------------------------------|---------------|
| Mansard—Construction | 1011-5 |
| In fireproof construction..... | 1002-5g |
| Mantel—Wooden | 809-5d |
| Marquise—Limitation | 405-4h |

Index

| | Section |
|--|---------|
| Masonry —Approved masonry defined..... | 200 |
| Ashlar | 806-6 |
| Brickwork | 806-3 |
| Construction | 806-2 |
| Hollow wall, hollow block and solid block..... | 806-5 |
| In fireproof construction..... | 1002-2 |
| Materials | 806-1 |
| Mortar | 806-8 |
| Piers | 806-2d |
| Protection against freezing..... | 806-2a |
| Stone | 806-4 |
| Stucco | 809-7 |
| Veneer | 806-7 |
| Wall thicknesses | 806-9 |
| Working stresses | 706-3 |
| Material (see building material). | |
| Means of Egress (see exit facilities). | |
| Mechanical Ventilation —In bathrooms and water-closets | |
| | 505-4 |
| In business and workrooms..... | 505-2 |
| In public and institutional buildings..... | 505-3 |
| In rooms below grade..... | 505-6 |
| In service pantries and storerooms..... | 505-5 |
| Mill Construction (see note under definition of heavy timber construction.) | |
| Mortar —Cement-lime-mortar defined | 200 |
| Cement-mortar defined | 200 |
| Kinds required | 806-8 |
| Lime-mortar defined | 200 |
| Motor Vehicle Repair Shop (see note under definition of Garage). | |
| Moving Buildings —Application for permit..... | 102-1 |
| Permit | 103-3 |
| When prohibited | 401-4 |
| Multifamily-House —Ceiling construction | 810-7 |
| Definition | 200 |
| Exits required | 602-4 |
| Partitions | 810-5 |

N

| | |
|--|--------|
| National Board of Fire Underwriters, Regulations (Appendix A). | |
| National Electrical Code—Used as standard..... | 1601-2 |
| Nonfireproof Construction (see note under definition of Ordinary Construction). | |
| Nursery—To be fireproof..... | 402-2 |

O

| | |
|--|--------|
| Occupancy—Certificate required | 104 |
| Change of | 104-7 |
| Classification | 300-1 |
| Doubtful | 300-3 |
| Meaning of "occupied"..... | 200 |
| Mixed | 300-2 |
| Temporary | 104-4 |
| Occupants—Number permitted | 601-2 |
| Office Building (see business-building). | |
| Oil Burning Equipments | 1212 |
| Ordinary Construction—Area limitation..... | 404-7 |
| Definition | 200 |
| Height limitation | 403 |
| Ornamentation (including architrave, belt course, column, cornice, lintel, moulding, pediment, pilaster, quoin, rustication, sill)—Exterior..... | 405-4 |
| Outhouse—Within fire limits..... | 401-6b |
| Overcrowding—Prohibited | 501-12 |
| Ownership—Registration (Appendix R). | |

P

| | |
|---|---------|
| Parapet Wall—Construction | 806-12 |
| Partition—Construction, non-bearing | 810-4 |
| Firestopping | 1007 |
| In cellar | 810-6 |
| In fireproof construction | 1002-6 |
| In multifamily houses | 810-5 |
| In semifireproof construction | 1003-4 |
| Party Wall—Definition | 200 |
| Thickness | 1005-1d |

Index

| | Section |
|--|---------|
| Passageway—Construction | 608 |
| Definition | 200 |
| Live-load | 703-4 |
| Passenger Elevator (see elevator). | |
| Penthouse—Construction | 1011-3 |
| Definition | 200 |
| Permit—Action on application..... | 103-1 |
| Application for | 102 |
| Approval in part..... | 103-2 |
| Conditions of | 103-4 |
| Demolition | 102-1 |
| Display sign | 1800-1 |
| Expiration by limitation..... | 103-6 |
| Form | 102-2 |
| Moving buildings | 103-3 |
| Permit fees (Appendix Q). | |
| Plans, accompanying | 102-3 |
| Posting | 103-7 |
| Revocation | 103-8 |
| Signature required | 103-5 |
| When required | 102-1 |
| Personal Injury—First aid..... | 919 |
| Medical attention | 919 |
| Piazza—Within fire limits..... | 401-6f |
| Pile—Concrete | 802-5 |
| General requirements | 802-5a |
| Tests | 802-5k |
| Wood | 802-5 |
| Pipe Holes—To be filled..... | 1007-7a |
| Pipes—Hot water and steam..... | 1210 |
| Place of Assembly (see also public-building)—Aisles. | 1300-2 |
| Curtain | 1301-6 |
| Dressing room | 1301-5 |
| Exits required | 602-5 |
| Galleries | 1300-3 |
| Grandstands | 1300-4 |
| Height limitation | 403-3 |
| Live-load | 703-2 |

| | Section |
|---|---------|
| Place of Assembly —Restrictions as to use of roof... | 1302-1 |
| Seating | 1300 |
| Separation from other occupancies..... | 1303 |
| Stage | 1301 |
| Theatre curtain construction (Appendix P). | |
| Plans —Certified copy on job..... | 103-7b |
| For proposed work..... | 102-3 |
| Plot Diagram —Adherence to..... | 103-4c |
| To accompany application for permit..... | 102-4 |
| Plumbing —Certificate | 1502-7 |
| Installation | 1502-1 |
| Outside water-closets prohibited..... | 1502-6 |
| Separate toilets | 1502-4 |
| Shut-off valves | 1503 |
| Toilet facilities required..... | 1502-3 |
| Toilet rooms | 1502-5 |
| Water supply | 1502-2 |
| Power Drive —Forced draft systems..... | 1204-4 |
| In slow-burning construction..... | 1004-6 |
| Privacy —Required | 501-11 |
| Private Garage (see garage). | |
| Protected Construction (see note under definition of Semifireproof Construction). | |
| Public-Building —Area limitation | 404 |
| Definition | 200 |
| Height limitation | 403-3 |
| Height limitation exception..... | 403-8c |
| Light and ventilation..... | 501-3 |
| Lighting | 1500-1 |
| Public Garage (see garage). | |

R

| | |
|--|--------|
| Radiator —Not to obstruct exit facilities..... | 611-5 |
| Recesses in Walls —Restriction..... | 806-13 |
| Register —Construction | 1209 |
| Registering of Ownership (Appendix R). | |
| Regulations, National Board of Fire Underwriters (Appendix A). | |

Index

| | Section |
|---|---------------|
| Reinforced Concrete (Appendix J). | |
| Columns | 706-4 |
| Concrete mixture | 807-2 |
| Definition | 200 |
| Design | 807-4 |
| Protection of reinforcement..... | 807-6 |
| Protection against frost..... | 807-7 |
| Reinforcement | 807-3 |
| Removal of forms..... | 807-8 |
| Walls | 807-5 |
| When considered fireproof..... | 1002-3 |
| Working stresses | 706-4 |
| Repair—Buildings to be kept in repair..... | 810-12 |
| Definition | 200 |
| Elevator | 1401 |
| Permit not required..... | 102-6 |
| Residence-Building—Area limitation | 404 |
| Definition | 200 |
| Height limitation | 403-5 |
| Retaining Wall—Construction and design..... | 804 |
| Revolving Door—Use limited..... | 610-3 |
| Riveting—When required | 808-6 |
| Roof (see also roofing and roof structure). | |
| Fireproof construction | 1002-5 |
| Heavy timber construction..... | 1004-5 |
| Household purposes | 1302-2 |
| Live-load | 703-5 |
| Protection during construction..... | 907 |
| Restricted as place of assembly..... | 1302-1 |
| Semifireproof construction | 1003-3 |
| Roofing (see also roof) — Combustible roofing pro- | |
| hibited in fire limits..... | 401-2b |
| Materials | 1010-1 |
| Permissible repairs | 1010-2 |
| Wooden shingles (Appendix L). | |
| Roof Structure—Bulkheads | 1011-2 |
| Construction | 1011-1 |
| Dormers | 1011-6 |

| | Section |
|---|---------|
| Roof Structure—Mansards | 1011-5 |
| Penthouses | 1011-3 |
| Tanks | 1011-7 |
| Room (see also habitable-room)—Exits required.... | 602 |
| Light and ventilation..... | 501 |
| Rules—Amendments or repeal..... | 101-5e |
| Governing new materials and construction..... | 101-5b |
| Hearings | 101-5c |
| Issued by building official..... | 101-5a |
| Publication | 101-5c |
| S | |
| Safeguards During Construction (see construction safeguards). | |
| Salamanders—Protection | 910-2 |
| Scaffolds—Construction and protection..... | 901 |
| School (see public-building). | |
| Height limitation | 403-3 |
| Scuttle—Construction | 1010-5 |
| When required | 1010-5a |
| Seating—Arrangement | 1300-1 |
| Galleries | 1300-3 |
| Grandstands | 1300-4 |
| Semifireproof Construction—Acceptable forms..... | 1003-1 |
| Area limitation | 404-5 |
| Beams and girders..... | 1003-2 |
| Columns | 1003-2 |
| Definition | 200 |
| Fire test data (Appendix D). | |
| Floors and roof..... | 1003-3 |
| Height limitation | 403 |
| Interior finish | 1003-5 |
| Lintels | 1003-2 |
| Partitions | 1003-4 |
| Trusses | 1003-2f |
| Service Pantry—Light and ventilation..... | 501-6 |

Index

| | Section |
|---|---------|
| Shaft—Construction | 1009 |
| Definition | 200 |
| Existing buildings | 1009-9 |
| Openings permitted | 1009-4 |
| Vent shafts | 503 |
| When required | 1009-1 |
| Shaftway (see shaft). | |
| Shingles—Wooden (Appendix L). | |
| Show Window—Construction | 810-3 |
| Shut-Off Valves—When required | 1503 |
| Sidewalk—Live-load | 703-6 |
| Sidewalk Shed—Walkway | 902-3 |
| When required | 902-1 |
| Sign (see display-sign). | |
| Skeleton Construction—Walls | 806-9g |
| Party walls | 1005-1d |
| Skylight—Construction | 1011-4 |
| For light and ventilation..... | 504 |
| Over stage in place of assembly..... | 1301-9 |
| Protection during construction..... | 907 |
| Vent shafts | 503-2 |
| When screening required..... | 1011-4 |
| Slow Burning Construction (see note under definition of Heavy Timber Construction). | |
| Smoke Pipe—Fire protection | 1202 |
| Restriction | 1202-2 |
| Smokestack—Construction | 1101-1 |
| Exterior | 1101-3 |
| Height | 1101-2 |
| Interior | 1101-4 |
| Restricted use | 1101-5 |
| Snow (see note under §703-5a). | |
| Soil—Bearing capacity | 707-1 |
| Filled in ground..... | 707-3 |
| Tests | 707-2 |
| Solid Block—Definition | 200 |
| Sprinkler Equipment (see automatic sprinklers). | |

| | |
|---|---------|
| Stable (see also storage-building). | |
| Impervious floors | 1305 |
| Within fire limits..... | 401-6a |
| Stage —Appurtenant rooms | 1301-4 |
| Construction | 1301-7 |
| Doors and windows..... | 1301-8 |
| Dressing rooms | 1301-5 |
| Electrical equipment | 1301-12 |
| Enclosure walls | 1301-2 |
| Lights | 1301-11 |
| Proscenium wall | 1301-3 |
| Shelving in appurtenant rooms..... | 1301-10 |
| Ventilator | 1301-9 |
| Stairs (see also stairway)—Firestopping..... | 1007-6 |
| Handrails | 604-8 |
| Required width | 604-5 |
| Space under, to be kept clear..... | 604-9 |
| Support of treads..... | 604-1b |
| Temporary | 908-1 |
| To be installed promptly..... | 908-1 |
| Treads and risers..... | 604-6 |
| Winders prohibited | 604-6b |
| Stairway (see also stairs)—Basement..... | 604-3 |
| Definition | 200 |
| Exterior, construction | 607 |
| Interior, construction | 604-1 |
| Interior, enclosure | 604-2 |
| Landings | 604-7 |
| Light and ventilation..... | 501-8 |
| Live-load | 703-4 |
| Moving | 604-4 |
| Outlet | 603-4 |
| When required to extend to roof..... | 603-4c |
| Standard Fire Test (Appendix C). | |
| Definition | 200 |
| Standpipe —Carried up with construction..... | 909-3 |
| Construction | 1701-4 |
| Control at ground level, when required..... | 1703 |
| Fire department connection..... | 1701-5 |

Index

| | Section |
|--|---------|
| Standpipe—Hose | 1701-6 |
| Inspected appliances (Appendix B). | |
| Location | 1701-3 |
| Number | 1701-2 |
| Outlets | 1701-6 |
| Pumps | 1701-8 |
| Size | 1701-1 |
| Tests | 1701-9 |
| Water supply | 1701-7 |
| When required | 1701-1 |
| Steam Pipes (see pipes). | |
| Steel and Iron Construction—Bolting | 808-7 |
| Cast iron columns..... | 808-2 |
| Cast iron, working stresses..... | 706-6 |
| Column bases | 808-4 |
| Connections in fireproof buildings..... | 1002-4i |
| Gas cutting | 808-9 |
| Lintels, beams and girders..... | 808-5 |
| Protection against corrosion..... | 808-12 |
| Protection against fire..... | 808-13 |
| Riveting | 808-6 |
| Steel columns | 808-3 |
| Templates | 808-11 |
| Tie-rods | 808-10 |
| Tie-rods | 1002-4i |
| Welding | 808-8 |
| Working stresses | 706-5 |
| Stone Masonry—Construction | 806-4 |
| Working stresses | 706-2 |
| Storage-Building—Area limitation | 404 |
| Definition | 200 |
| Height limitation | 403-7 |
| Height limitation exception..... | 403-8c |
| Storeroom—Light and ventilation | 501-6 |
| Street Encroachments—Alterations | 405-7 |
| As structural supports prohibited..... | 405-3 |
| Existing | 405-8 |
| Permission revocable | 405-6 |
| Restrictions | 405 |

Index

| | Section |
|---|---------|
| Street Encroachments—To be removable..... | 405-2 |
| When permitted | 405-4 |
| Structure (see also building). | |
| Certificate of completion..... | 105-1 |
| Definition | 200 |
| Stucco—Construction | 809-7 |
| Surveys (Appendix R). | |

T

| | |
|---|----------|
| Tank—Construction | 1011-7 |
| Templates—Steel and iron construction..... | 808-11 |
| Tests—Appliances | 701-2b |
| Building official authorized to make..... | 701-2a |
| New material | 701-2 |
| On completed work..... | 701-7 |
| Pile, capacity | 802-5k |
| Soil, bearing capacity..... | 707-2 |
| Standpipes | 1701-9 |
| Theatre (see place of assembly). | |
| See definition public-building..... | 200 |
| To be fireproof..... | 402-2 |
| Toilet Facilities (see also water-closet). | |
| Compartment, construction | 1502-5 |
| During construction | 918-1 |
| Required | 1502-3 |
| Separate for sexes..... | 1502-4 |
| Trim (see interior finish). | |
| Trimmer Arch—For fireplaces or chimney breasts... | 1100-11b |

U

| | |
|---|-------|
| Unprotected-Metal Construction—Definition | 200 |
| Height limitation | 403-9 |
| Within fire limits..... | 401-2 |
| Unsafe Building—Emergency work..... | 106-4 |
| Removal or repair..... | 106-1 |
| Vacation | 106-5 |

V

| | |
|------------------------------|--------|
| Vault—Construction | 810-1 |
| In forced draft systems..... | 1204-6 |
| Limitation | 405-41 |

Index

| | Section |
|---|--------------|
| Veneer—Construction | 806-7 |
| Vent Flue—Construction | 1104 |
| For gas appliances | 1105-2 |
| Ventilation (see also light and ventilation). | |
| Forced draft system..... | 1204-7 |
| Vent Shaft (see also shaft)—Air duct required..... | 503-3 |
| Size | 503-1 |
| Skylights required | 503-2 |
| Violation—Abatement | 107-4 |
| Notice | 107-1 |
| Penalty | 107-3 |
| Stopping work | 107-2 |
| W | |
| Wainscoting—In fireproof construction | 1002-7d. |
| In ordinary construction..... | 809-5g |
| In semifireproof construction..... | 1003-5 |
| Wall (see also foundation-wall). | |
| Carried up uniformly..... | 806-2b |
| Chases and recesses..... | 806-13 |
| Firestopping | 1007 |
| Firewalls | 1005-1 |
| Height defined | 200 |
| Hollow | 806-5 |
| Hollow block and solid block, restricted..... | 806-5 |
| In frame construction..... | 809-6g, h, i |
| Lateral support | 806-10 |
| Parapets | 806-12 |
| Party walls | 1005-1 |
| Reinforced concrete | 807-5 |
| Restriction against wood..... | 806-2h |
| Skeleton construction | 806-9g |
| Heavy timber construction..... | 1004-1 |
| Support during excavation..... | 801-2 |
| Thicknesses | 806-9 |
| Underpinning, when required..... | 801-2 |
| Use of existing walls..... | 806-11 |
| Warm Air Heating—Pipes | 1208 |

| | Section |
|---|---------|
| Watchman—Required during construction..... | 912 |
| Water-Closet (see also toilet-facilities). | |
| Light and ventilation..... | 501-5 |
| Waterproofing—When required | 810-11 |
| Water Supply—During construction..... | 918-2 |
| Required | 1502-2 |
| Welding—Requirements for | 808 |
| Safeguards during construction..... | 911 |
| When permitted | 808 |
| Window (see also wall opening). | |
| Glass area required..... | 502-1 |
| Size | 502-2 |
| When fire protection required..... | 1008-1 |
| Wind Pressure (Appendix F). | |
| Allowable stresses | 704-3 |
| Roofs | 703-5 |
| When considered | 704-1 |
| Wired Glass—Enclosures for outside stairways.... | 607-6 |
| Fire doors and windows..... | 1008-5 |
| Size of lights (Appendix B). | |
| Wood—Interior finish in fireproof construction..... | 1002-7 |
| Working stresses | 706-7 |
| Wooden Construction (see also frame construction). | |
| Beams | 809-1 |
| Bolting | 809-4 |
| Columns and posts..... | 809-3 |
| Fire prevention | 809-5 |
| Girders | 809-2 |
| Joists | 809-1 |
| Protection against termites (Appendix M). | |
| Strength (Appendix K). | |
| Working Stresses—Cast iron..... | 706-6 |
| General requirements | 706-1 |
| Higher stresses, when permitted..... | 706-1b |
| Masonry | 706-3 |
| New materials | 706-1c |
| Reinforced concrete | 706-4 |

Index

| | Section |
|--|---------|
| Working Stresses—Steel | 706-5 |
| Stone | 706-2 |
| Wood | 706-7 |
| Workmanship—Quality required | 800 |
| Workshop—Included in “business-building” | 200 |
| Light and ventilation | 501-2 |

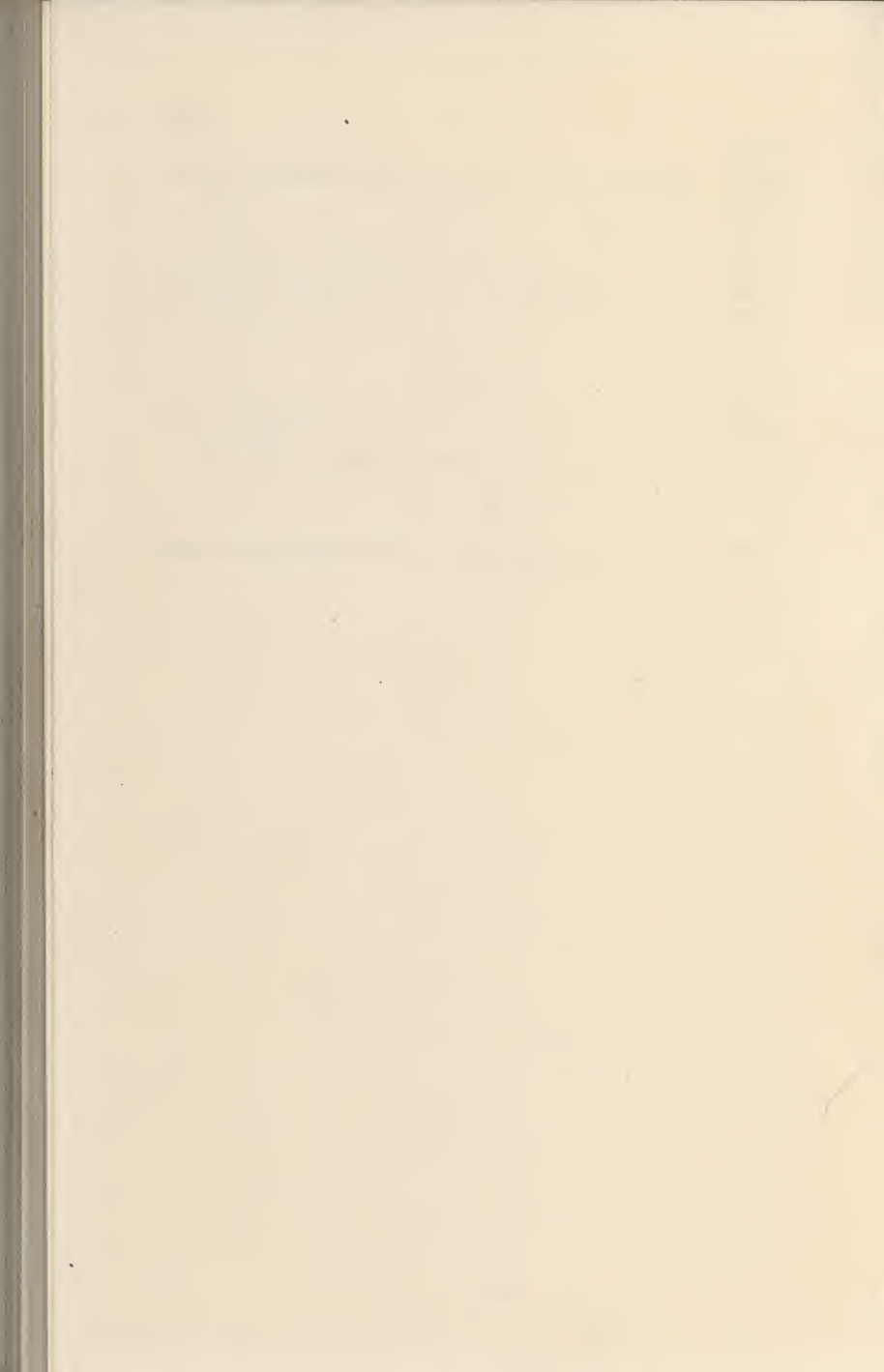
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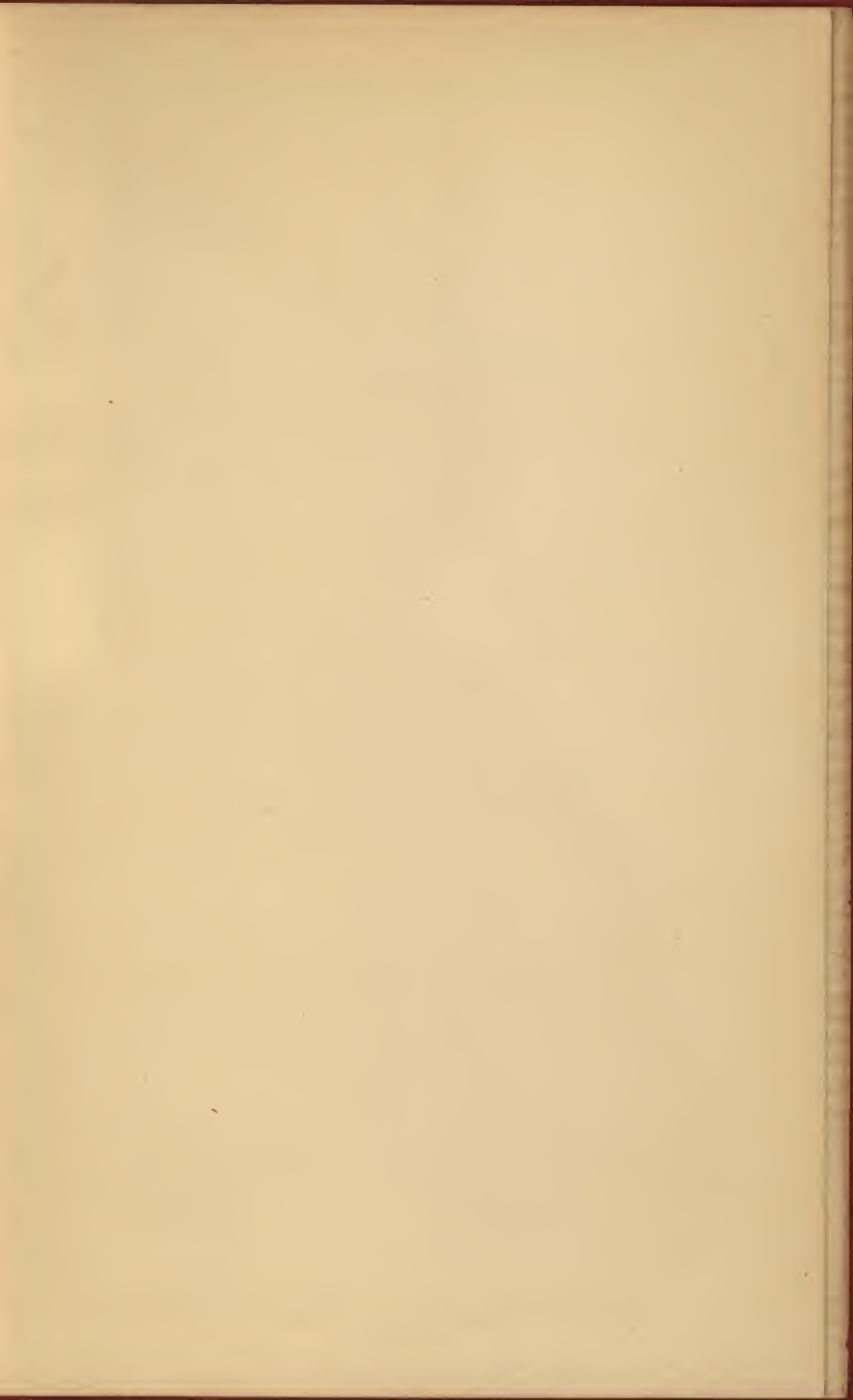
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|---------------------------------|-------|
| Yard—Definition | 200 |
| Live-load | 703-7 |
| (See note at end of Article V.) | |

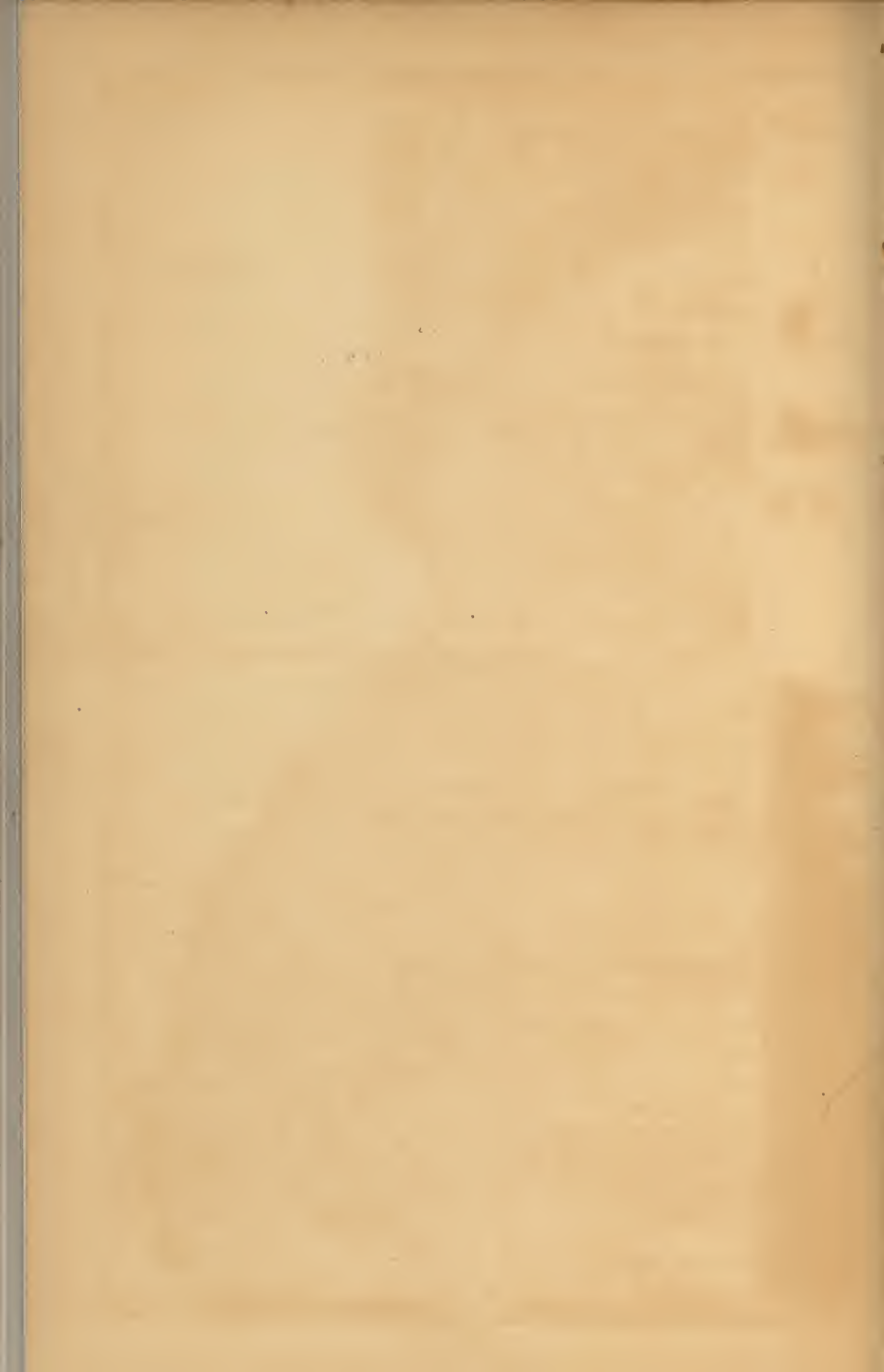
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| | |
|---|-----|
| Zoning Restrictions—To be controlling | 400 |
|---|-----|









WHITE

